Proceedings of the
American Association of Textile Chemists and Colorists

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Editor of Proceedings: Carl Z Draves, 30 Lahey St, New Hyde Park, N Y

January 19, 1953

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EMPLOYMENT REGISTER

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the Secretary.

52-71

Education: Ph D, Lausanne, Organic Chemistry, with education in textile microscopy at Mass Inst Tech.

Experience: research in organic chemistry and textile dyeing and printing.

Age: 62; single; references; North Atlantic coast preferred.

1-5, 1-22

Correction

IN the caption at the bottom of page P775 (November 24, 1952), Henry M Bliss is incorrectly identified as president of Massachusetts Mohair Plush Company. Mr Bliss is president of Pacific Mills.

—♦ ♦—

Southeastern Section Meeting Notice

THE next meeting of the Southeastern Section will be held at the Purefoy Hotel, Talladega, Ala, on February 7th.

—♦ ♦—

Mid-West Section to Hold "Past Chairman's Night"

PAST Chairmen of the Mid-West Section will be honored at the Section's February 14th meeting at the Bismarck Hotel, Chicago, Ill. The entire evening, to be known as "Past Chairman's Night" has been set aside for the occasion with Elmer F Smith, American Aniline Products, Inc, slated to be toastmaster.

The regular business and technical sessions will be held in the afternoon, during which Charles C Yeager, technical director of Scientific Oil Compounding Company, Inc, will speak on 'Fungicides in Textiles as Sales Promotional Tools". Dr Yeager was formerly chief, Fungus Control Unit, Wright-Patterson Air Base, USAF; Member, AAF Tropical Science Mission and past chairman, Textiles and Cordage Sub-Committee, Research and Development Board.

CALENDAR

AATCC

COUNCIL
April 17, June 5.

GENERAL RESEARCH COMMITTEE
(See Council dates)

NATIONAL CONVENTIONS
September 17-19, 1953 (Hotel Conrad Hilton, Chicago); 1954 (Atlanta, Ga): Sept 21-23, 1955 (Chalfonte-Haddon Hall. Atlantic City, N J).

HUDSON-MOHAWK SECTION
February 6, March 20, May 8 (Albany); June 19 (Outing).

MID-WEST SECTION
February 14 (Hotel Bismarck, Chicago, Ill); April 18 (Netherland Plaza, Cincinnati, O): June 20 (Outing. Lake Delavan, Wis); November 7 (Hotel Bismarck).

NEW YORK SECTION
January 30, February 27 (Hotel Statler, New York, N Y); April 17, May 22 (Swiss Chalet).

NORTHERN NEW ENGLAND SECTION
Mar 6 (MIT Faculty House, Cambridge); April 17 (Lowell Textile Inst, Lowell); May 15 (Andover CC, Andover); June 12 (Annual Outing); Nov 6 (LTI); Dec. 4 (MIT Faculty House).

PHILADELPHIA SECTION
Mar 6 (Kugler's Restaurant, Phila); April 24; May 22 (Outing, Manufacturer's Golf & Country Club); Sept 11; Oct 23; Dec 4; Jan 15, 1954.

PACIFIC SOUTHWEST SECTION
April 24 (Nikabob Cafe, Los Angeles).

PIEDMONT SECTION
April 11, (Robert E Lee Hotel, Winston-Salem, N C); June 12-13 (Mayview Manor, Blowing Rock, N C); Sept 12 (Hotel Charlotte, Charlotte, N C).

WESTERN NEW ENGLAND SECTION
Jan 30, Mar 20 (Rapp's Restaurant, Shelton, Conn); May 8 (Ladies Night); June 19 (Outing); Oct 2, Nov 6 and Dec 11 (Rapp's).

OTHER EVENTS

AMERICAN ASSOCIATION OF TEXTILE TECHNOLOGISTS
2nd Annual Symposium, Feb 3, Hotel Statler, New York.

AMERICAN OIL CHEMISTS' SOCIETY
44th Annual Meeting, May 4-6, Roosevelt Hotel, New Orleans, La; 27th Fall Meeting, November 2-4, Sherman Hotel, Chicago, Ill.

AMERICAN SOCIETY FOR QUALITY CONTROL
Textile Division: May 27-29, Convention Hall, Philadelphia, Pa.

AMERICAN SOCIETY FOR TESTING MATERIALS
1953 Annual Meeting. June 29-July 3, Chalfonte-Haddon Hall, Atlantic City, N J.

AMERICAN TEXTILE MACHINERY ASSOCIATION
Exhibit of American Textile Machinery, April 26-May 1, 1954, Atlantic City Exhibition Hall. Atlantic City, N J.

ASSOCIATION OF CONSULTING CHEMISTS AND CHEMICAL ENGINEERS, INC
April 21 (Hotel Belmont Plaza, New York, N Y—Symposium and Dinner); Annual Meeting—25th Anniversary-October 27 (Hotel Belmont Plaza, New York).

CANADIAN ASSOCIATION OF TEXTILE COLOURISTS AND CHEMISTS (Quebec Section)
Feb 21, Mar 21 (Physical Science Centre, McGill Univ. Montreal, Que); April 17-18 (Annual Meeting, Mount Royal Hotel, Montreal, Que); June 20 (Annual Golf Tournament).

GARMENT DYERS GUILD OF AMERICA
1953 Technical Clinic, November, Steuewe Plant, Rochester, N Y.

GLYCERINE PRODUCERS' ASSOCIATION
Convention, Jan 27 (Waldorf-Astoria, New York, N Y).

NATIONAL ASSOCIATION OF HOSIERY MANUFACTURERS
41st Knitting Arts Exhibition, April 27-May 1, Atlantic City Auditorium, Atlantic City, N J.

NATIONAL COTTON COUNCIL
15th Annual Meeting Jan 26-27 (Dallas, Texas). 4th Annual Cotton Research Clinic, Feb 18-20, Oglethorpe Hotel, Savannah, Ga.

NATIONAL INSTITUTE OF CLEANING AND DYEING
44th Annual Convention, Feb 13-15, Statler Hotel, Cleveland, O.

NEW YORK BOARD OF TRADE (DCAT)
27th Annual Drug, Chemical and Allied Trades Dinner, March 5, Waldorf-Astoria, New York, N Y.
Drug, Chemical and Allied Trades Section; 63rd Annual Meeting, Sept 24-27, Pocono Manor Inn, Pocono Manor, Pa.

PENNSYLVANIA STATE COLLEGE, SCHOOL OF HOME ECONOMICS
Annual Spring Weekend, April 17-18, State College, Pa.

PHILADELPHIA TEXTILE INSTITUTE ALUMNI ASSOCIATION
52nd Annual Banquet, Feb 6, Warwick Hotel, Philadelphia, Pa.

SOCIETY OF PLASTICS ENGINEERS, INC
9th Technical Conference, Jan 21-23, Hotel Statler, Boston, Mass.

SOCIETY OF PLASTIC ENGINEERS, INC
9th Technical Conference, Jan 21-23 (Hotel Statler, Boston, Mass).

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES
Feb 11, March 11—all at the Hotel Commodore, New York; June 11-13 (Joint Outing with Manufacturing Chemists' Association at The Greenbrier, White Sulfur Springs, W Va.

TEXTILE RESEARCH INSTITUTE
1953 Annual Meeting, Nov 12-13.

REPRINTS OF TEST METHODS

For the convenience of those using only Part III of the 1952 Year Book, on Test Methods, reprints of this alone can be purchased from the Secretary, AATCC, Box 28, Lowell, Mass, for $1.00, postpaid.

1952 YEAR BOOKS

The Year Book of 1952 has been mailed to all who were members in the year ending October 31, 1952. Extra copies can be purchased by members for $4.00; by others for $5.00. A member elected after October 31 is entitled to the book of 1953, but can purchase one copy of the book of 1952 at a reduced price of $3.00. Orders should be sent to the Secretary, AATCC, Box 28, Lowell, Mass.

NOTICE

In answer to inquiries as to the number voting and the closeness of the vote in the recent AATCC Presidential election, the following breakdown by Regions is presented:

Region	*Bonnar*	*Jacoby*
New England	219	346
Central Atlantic	710	490
Southern	202	174
Western	119	104
Unclassified	36	53
Totals	1286	1167

ONE HUNDRED EIGHTY-FOURTH COUNCIL MEETING

THE Council held its 184th meeting at the Hotel Statler in Boston on Thursday morning, November 6, 1952. Present were President C Norris, presiding; Arthur T Brainerd, Arthur W Etchell, Samuel L Hayes and Raymond W Jacoby, *Vice Presidents;* William R Moorhouse, *Treasurer;* Charles W Dorn, *Chairman of the Research Committee;* William D Appel, William H Cady, Carl Z Draves, Henry F Herrmann and Thomas R Smith, *Past Presidents;* Edward B Bell, Frank J O'Neil and Sawyer F Sylvester representing Northern New England; Edward J Allard, Robert W Joerger and Alden D Nute representing Rhode Island; J Edward Lynn representing Western New England; J Robert Bonnar, Carl H Brubaker, Weldon G Helmus, Patrick J Kennedy and Henry L Young representing New York; A E Raimo, Ernest E Rettberg, Jr, Charles A Sylvester, Percival Theel, S Graeme Turnbull, Jr, and Jackson A Woodruff representing Philadelphia; A Henry Gaede, Joseph Lindsay, Jr, and R Hobart Souther representing Piedmont; C Russell Gill and H Gillespie Smith representing Southeast; Glenn R Bellamy representing South Central; Joseph H Jones and Elliott Morrill representing Mid-West; Dr R W Cunliffe from England and Dr H Ris from Switzerland; Kenneth H Barnard and George O Linberg of the Convention Committee; George L Baxter of the Corporate Membership Committee; William A Holst of the Committee on Constitution and Bylaws; Leonard S Little, Chairman of the Executive Committee on Research; Alfred J Olson, Chairman of the Mid-West Section; Albert E Sampson, *Assistant Treasurer;* George H Schuler and Glenn D Jackson, Jr, of the Publicity Committee; and Harold C Chapin, *Secretary.*

Dr Cunliffe extended the greetings of the Society of Dyers and Colourists.

The Treasurer's annual report, of July 31, was accepted; also the Secretary's report of the 183rd Council meeting and financial report of October 15.

Mr Cady reported that, except for proof reading, the work for which the Colour Index Committees had been appointed was completed. He, therefore, recommended that all be discharged with thanks at the close of the year, and that a small committee be appointed to supervise proof reading and other remaining details. This was approved. The present Steering Committee was then designated to handle technical matters, and the Committee on Publications, Publicity and Technical Supplies to handle problems of publication and sales. There was further discussion of proposed sales in advance of publication, with particular reference to the problem of adjustment between the final price and prepayments made in the two currencies. This was finally referred to the Committee on Technical Supplies, in conference with the Steering Committee, with power to act for the Association in reaching an agreement with the Society of Dyers and Colourists. Professor Theel reported progress toward publication of the Vat Dyeing monograph and the pamphlet on Dyehouse Mathematics.

Mr Little said that the next meeting of the Executive Committee on Research, on December 4, would be in Lowell to permit inspection of facilities and work in progress. Any members of the Council who were interested were invited. More work for the Chemical Warfare Service and Quartermaster Corps was under consideration. Work had started on a project at the Philadelphia Textile Institute. Amendment of the Bylaws was contemplated to define relations between the Research Committee, the ECR, and their officers. Meetings of ISO committees were planned for the following week in New York. Glenn R Jackson, Jr, had been appointed Secretary of the ECR.

Mr Baxter reported progress on new Corporate memberships. Mr Barnard reported for the Committee on Conventions, Mr Linberg on the Boston Convention then in progress, and Mr O'Neil on the Intersectional Contest.

M M Hartnett and F J O'Neil were appointed to serve with the Secretary as tellers for the 1952 election. P J Wood, as Chairman, W D Appel, A E Sampson, J A Woodruff and H L Young were appointed to serve with the Treasurer and Secretary as the Committee on New Personnel.

There was presented a petition, signed by the requisite number of Senior members, for authorization of a Washington Section. This was approved, and Dr Walter M Scott was appointed Secretary *pro tem* for the organization meeting. The Committee on Membership and Local Sections was asked to recommend geographical boundaries, and the Secretary of the Association to determine by letter ballot the preference of each member in adjoining territory as to future Sectional affiliation.

Mr. Rabold was voted the thanks of the Association for his services as President in the past three years.

For the Committee on Membership and Local Sections Mr Jacoby recommended that the same allowance of two years toward experience qualifications for Senior membership, now allowed textile college graduates, be granted to all holding bachelor degrees in chemistry or other physical science; and that allowances for education toward membership experience qualifications be printed in the next Year Book. This was voted. Each of the following was elected to the class of membership specified:

(Concluded on Page P43)

New York Section——

BAROTOR—PRESSURIZED FABRIC-DYEING MACHINE*

PAUL M COLE
Textile Fibers Dept
E I du Pont de Nemours & Co, Inc

INTRODUCTION

THE new synthetic fibers that are now reaching the American market in small quantities and promise to expand in ever increasing volume are known to be more difficult to dye than the older fibers. The industry has for some time recognized that this disadvantage can largely be overcome by the use of high temperatures gained under pressure and has put this knowledge to use in the dyeing of yarn, raw stock, and knit goods. Fortunate has been our lot in those cases because many of the existing atmospheric machines require but minor change for pressurization.

It is also generally recognized that the advantage of pressure would be an even greater asset to fibers, such as nylon, "Orlon" acrylic fiber, and "Dacron" polyester fiber if it could be applied to the dyeing of fabrics. The potential usefulness is not limited to any specific class of materials but includes the complete range of weights in both spun and continuous-filament forms. This has been a big challenge to the industry and has necessitated a thorough analysis of the problems of pressurized aqueous dyeing: first, in relation to the distinctive properties of the new fibers and, second, in relation to the requirements of the trade.

With respect to this second consideration, the conclusion has been reached that a major need is for batch equipment to handle small lots economically. This equipment must particularly lend itself to the dyeing of the heavy shades which have been unobtainable with existing processes. Since batch types of equipment are the most easily pressurized, as a general rule, concentration on this objective appears doubly sound.

DYEING REQUIREMENTS FOR NEW FIBERS———Going back to the other factor, the distinctive characteristics of the new fibers, we find that they are quite dictatorial as to what kind of a pressurized batch machine they will permit themselves to be dyed in. These fibers speak right up and tell us that they are fussy about three things: first, they want to get dyed in a hurry; second, they want their freedom; and third, they want open support. They will have nothing to do with slow dyeing by migration of color and insist that we put the color on quickly where we want it and leave it there. The insistence upon open-width support and freedom from tension or stress is particularly understandable in view of the greater tendency for wrinkling and heat setting at high temperatures. These factors must be recognized and given full consideration in equipment design if satisfactory results are to be expected.

Pressurization of conventional fabric-dyeing machines is the natural direction of gravitation, but, after considerable activity along this line, we have concluded that the obstacles are extremely serious if not insurmountable. Let me briefly point out a few of the major handicaps.

JIG SHORTCOMINGS———The jig is the conventional machine for batch-dyeing filament fabrics. It is low in cost and simple of operation. Nevertheless, it has four shortcomings, any one of which is probably serious enough to make a pressure jig unsatisfactory for wide usage unless drastic innovations are forthcoming. These four factors are as follows:

1) CREASING
2) STRETCHING
3) LEVELING
4) SAMPLING

Creasing is a familiar story to everyone who has operated a jig. Under atmospheric conditions this problem is not too serious. Wrinkles are readily noticed and eliminated by hand manipulation of the fabric while running. Pressurization would make the detection more difficult and the manipulation well nigh impossible. The newer fibers are particularly susceptible to creases because their moduli are lowered by elevation of temperature. Creased fabrics at the optimum dyeing temperature would in most instances be ruined fabrics.

Stretching and its bad effects would likewise be made more severe by the high temperatures. Fabrics of harsh hand would be the consequence. Of course, there can be no stretching if there is no tension. A jig, however, will not operate without some tension. This tension, moreover, is not temporary, but continuous. There just is not place in a jig for relaxation.

Turning to the third item, we consider an inherent characteristic of jigs. Any given portion of the fabric passes through the bath at extremely infrequent intervals. It is common practice for as much as twenty or thirty minutes to elapse while

P M COLE

An engineer describes a new dyeing machine, the "Barotor," which is ingeniously designed to permit the application of dyes on piece goods at high temperatures and pressures in a closed autoclave.

Provision is made to keep the fabric at full width without wrinkles at only slight tension over bars, which move in such a way in an enclosed rotating carrier that the fabric moves steadily forward with respect to the bars. At the same time each portion of the goods reenters the hot dye liquor several times each minute.

The Barotor may have many uses, but its main immediate interest is for dyeing piece goods of the new wholly synthetic fibers.

* Presented before the New York Section in the Swiss Chalet at Rochelle Park, N J, on Sept 26, 1952.

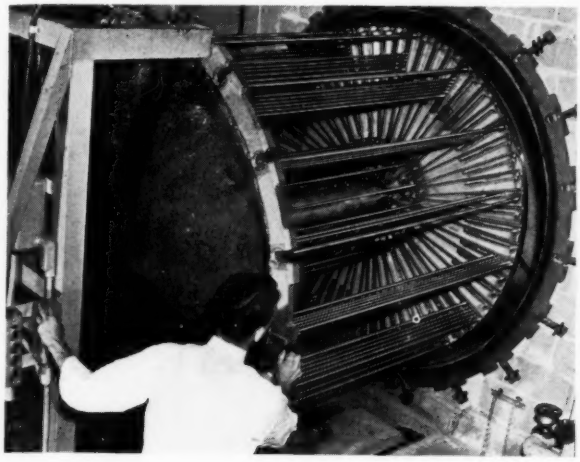


Figure 1
Barotor Operable at 25-Pound Pressure
Rotor Slid Out and Forward for Loading

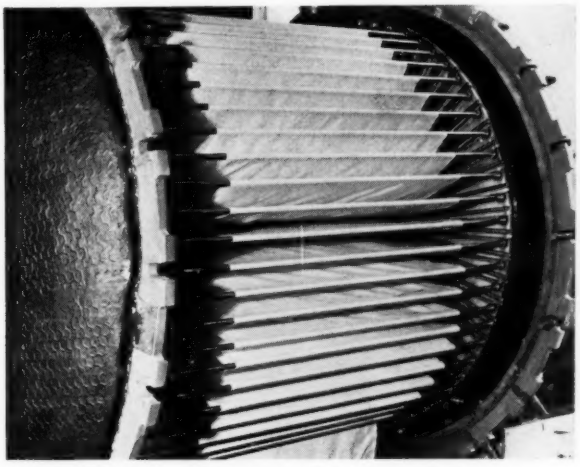


Figure 2
Loading Fabric on Rotor

one pass is made through the bath. Pressures in the range of 15-25 pounds would in many instances cause the color to exhaust almost completely before all of the fabric contacts the dye. Obviously, this means a jig cannot utilize the potential speed advantage of high temperatures. A major part of the time for most atmospheric jig dyeings is employed in end-to-end leveling. Approximately the same number of passes and, hence, the same amount of time would be required under pressure. The buyer of a pressure jig could not under these conditions expect to compensate for greater cost by greater productivity. He might even be confronted with a lower productivity through his inability to inspect the fabric and thereby determine when levelness has been achieved.

This brings up the fourth factor—sampling. Shade matching on atmospheric jigs is facilitated by cutting swatches from the fabric during the dyeing. This imposes a stubborn engineering problem for pressure jigs. Opening the vessel is not the answer, since that would entail the time-consuming and costly operations of cooling, reheating and purging of air.

BECK SHORTCOMINGS —— Let us now turn to the conventional equipment for dyeing spun yarn fabrics, the beck. Here again we have the following four major handicaps:

1) ROPE MARKING
2) LEVELING
3) SAMPLING
4) PRESSURIZING

Rope marks are known to be more difficult to avoid as the temperature of atmospheric becks approaches the boil. Higher temperatures should be increasingly serious because of the plasticizing and thermal-setting effects.

Color exhaustion must proceed slowly in order to prevent unlevelness in the folds. The beck takes its place alongside the jig as requiring hours for leveling through migration of dye. Sampling under pressure would also present the same degree of difficulty on the beck as on the jig.

The last item, pressurization itself, is even more imposing. The very nature of the beck makes it take an uncylindrical shape. The stresses in such a shape are prohibitive. The alternative is to house the entire unit in an extremely large and expensive cylinder having a tragic waste of space.

Other atmospheric fabric-dyeing machines, without exception, have equally serious faults. Their inadequacies are not superficial design factors, but deep inherent characteristics. Since it does not seem likely that the advantages of pressure in the dyeing of piece goods will ever be captured for general use by atmospheric machines, bolstered for a task for which they were never intended, entirely new machines must be developed for the job ahead. If we are then to part with the past and look to uncharted fields, we must first make certain that our goals are the highest. It would be foolishness to spend extensive capital on equipment which would solve some immediate problem in 1952, but would be inadequate for the needs of 1953 or 1960. The industry should not fall prey to the temptation of trusting its future in the new fibers on expedients that will just get by on specialized applications under limited initial production. In turning to new machines, let us not drag along the burden of old ways and merely try to minimize the handicaps, but rather let us set our sights high enough to realize, if possible, all of the advantages of pressure, and at the same time strive to eliminate the deficiencies that have plagued us in the past.

BAROTOR MACHINE

This approach to the problem with a forward view of the possibilities of the new fibers and the future needs of the dyer have resulted in the development of a new machine named Barotor. This machine has just recently been disclosed to the trade.

Figure 1 shows a Barotor as it is installed at our Newport Textile Laboratory for operation up to 25 pounds gauge pressure. The exterior is nothing more than a simple horizontal autoclave. You can see the head of the autoclave in the picture. The remainder of the vessel, for saving of building space, projects outdoors through the wall. All of the operating equipment and instruments are within the building. There is a single driven shaft passing through the center of the head. This shaft turns at low speed and is sealed like any agitator shaft. You will note the large carriage mounted on tracks in front of the autoclave. This carriage removes the head and interior fabric holder for unloading and loading.

ROTOR———The heart of the dyeing machine is a large rotor which in this case is six feet in diameter and designed for 600 yards of 65-inch material. It fills the autoclave, utilizing all of the available space. The fabric is loaded on the rotor as shown in Figure 2. Our present expectation is that with some fabrics we will be able to double this load. Additional capacity can

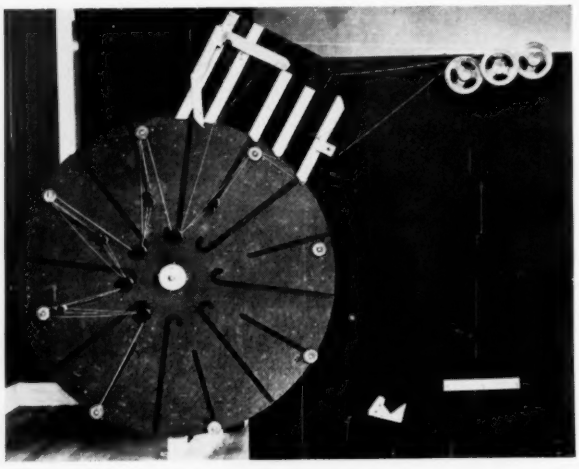


Figure 3
Schematic Model of Barotor with Strings

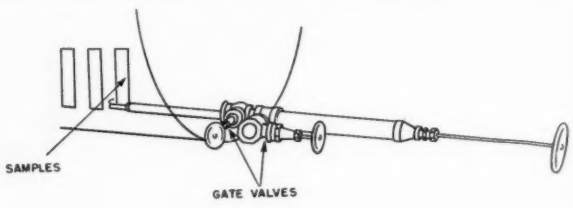


Figure 4
Sampling without Loss of Pressure

be obtained by using a larger-diameter rotor or by employing a long autoclave with two or more rotors on the same shaft.

When the vessel is closed the dye liquor is added to the desired depth. A depth of one-eighth of the diameter is sufficient for proper immersion of the fabric, but shallower depths are possible, and the vessel in the other extreme can be completely filled with dye solution if desired. The range of bath ratios hereby permitted with an average fabric load is a minimum of 2:1 and a maximum of 160:1.

OPERATION ——— The operation of the mechanism can best be understood by referring to Figure 3 showing the schematic model, which handles string instead of fabric. This you can imagine as the cross section of a rotor having eight sets of supporting bars. The six-foot rotor on our large machine has eight times as many of these bars. You will note that there is a set of bars that are retained in peculiar-shaped slots at the periphery of the rotor heads. There is another set of bars located at the interior end of J-shaped slots. The fabric is on the outside of the exterior bars and the inside of the interior bars. In this case there are three complete wraps, the ends of each wrap having been joined together. All wraps are separated by spacer bars, which are retained in the radial portion of the peripheral slots.

The rotor is turned in a counter-clockwise direction by the shaft passing through the head of the vessel. Gravity does the rest. As each bar reaches a position approximately 60° from the horizontal it rolls to the interior end of its slot. At the same time another bar is passing the horizontal and rolls to the exterior end of its slot. The one bar thereby takes up the slack that is let out by other. In this manner the fabric is made to progress continuously forward relative to the rotor. All portions of the fabric have equal contact with the liquor even when the minimum bath depth is employed, and all portions may be made to pass through the bath several times a minute, not just once every twenty minutes as with a jig. This makes extremely rapid and continuous leveling possible and permits the dyeing to be carried out in minimum time.

The amount of fabric loaded on the rotor in normal operation is such that each bar reaches the extreme outer end of the slot before all of the available slack is taken up. This is true even after shrinkage has occurred. The weight of the bars is therefore never brought against the fabric, and the fabric is never subjected to tension. The fabric is sufficiently restrained at all points, however, to permit no freedom for folding. In special cases where tensioning of the fabric is desired, the loading is made so that the weight of the bars comes against the fabric and the fabric restrains the bars from reaching the extreme position. Variation in length of pieces can be compensated by skipping any desired number of bars.

LOADING———The loading and unloading procedures are of interest. When the rotor is empty, the exterior bars, alone, are in place. The interior bars and spacers are held in a magazine, which during loading is held adjacent to the rotor at an angle of approximately 45° above the horizontal. The ends of fabric are threaded through spaces in the magazine and temporarily attached to one of the exterior bars. The rotor is then turned in a counter-clockwise direction. The interior bars and spacers automatically feed into their respective slots, carrying the loops of fabric into place. One revolution of the rotor results in complete loading of the desired number of wraps. The ends of the wraps are then sewed together. As long as the rotor is turned in the counter-clockwise direction the bars remain in place and the progressing action continues in the manner already described.

UNLOADING —— Unloading is accomplished by holding the magazine below the horizontal, cutting the seam, threading the ends back through the magazine, and then rotating the unit in the clockwise direction. The bars roll into the magazine and discharge the fabric. Here again one revolution completes the operation.

SAMPLING——Sampling is considered to be a prerequisite for a useful piece-goods dyeing machine. Figure 4 shows how sampling is done on the Barotor without loss of pressure. On the head of the vessel near the lowest point of the circumference is a small opening with a pipe fitting that leads to two gate valves, connected at right angles to each other. In line with the opening and beyond the valves is a section of joining pipe which is reduced at the far end. A small rod passes through a packing gland in the reduced end. It is connected to a sliding bar, which can be passed through one gate valve into the vessel. The other gate valve opens to the room. On the interior end of the bar is a hook. A strip has been sewed during loading to the outer fabric wrap along the seam. Tabs of the processed material approximately three inches wide and six inches long have been sewed to the strip with a weak thread. Each tab has a free end which is weighted with stainless steel balls in a hem or with glass beads on a loop of heavy cord. These tabs pass around the rotor over the same path and with the same dye exposure as any and all other parts of the fabric. When they reach the lowest point of travel, the weighted hem causes the free end to hang below the rotor. Sampling is accomplished by closing the valve leading to the room, opening the valve leading to the vessel, and pushing the bar through this second valve so that the

hook comes into the path of the nearest tab. When the tab in its rotation reaches the hook, it snags itself and is torn free of the fabric by further travel of the rotor. The bar is then withdrawn and the inner valve immediately closed. The valve leading to the room is then opened and the sample is removed from the hook. Additional samples can be obtained by repeating the operation, each time the hook being moved into the path of a different tab as indicated by calibrations on the small operating rod.

ADVANTAGES OF BAROTOR —— This machine promises to realize all of the following attainments, which we have set as our goal—a list of features that we believe defines an ideal dyeing machine:

1. Fabric in open width at all times.
2. Tensionless and wrinkle-free.
3. All points in unifor.n and frequent bath contact.
4. Rapid bath agitation or circulation.
5. Wide range of bath ratios permissible.
6. Operability with all fabric constructions, both filament and spun.
7. Exact duplication of conditions between laboratory and production scale.
8. Fabric sampling and bath additions made without opening vessel or losing pressure.
9. Samples always representative of entire fabric.
10. No need for attention during dyeing.
11. Handling of batches as small as 100 yards and batches in excess of 1000 yards.
12. Cylindrical shape with 100% utilization of space.
13. Minimum cost of operation and maintenance.
14. Investment commensurate with productivity in comparison with atmospheric dyeing of natural fibers.

These characteristics might further be summarized by saying that the Barotor is a simple, open-width, tensionless, wrinkle-free, rapid-leveling, pressurized, fabric-dyeing machine.

We have made several hundred dyeings on a fourteen-inch-diameter laboratory machine. Filament and spun fabrics in extreme ranges have been successfully dyed. Knit goods have also been processed with good results. Our six-foot-diameter machine is now being evaluated. The number of dyeings to date has not been extensive, but the machine has demonstrated good performance with both filament and spun materials.

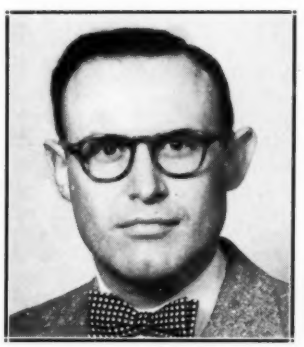
There is much to be learned yet about this machine. In particular, there remains the job of building and testing an automatic loader which we have under design. Then too, we have yet to explore the limits of capacity and have much experimentation ahead with a variety of fabric constructions. It is to be expected that textile-machine firms will make improvements and dyers will more than likely learn many tricks of operation that have not occurred to us. Nevertheless, the performance at this early stage of development has been highly encouraging because fabrics have been dyed without wrinkling, shrinkage has indicated freedom from tension, fabric hand has exhibited superior quality, and heat stabilization has been a welcome by-product.

DYEING FABRICS UNDER PRESSURE*

J E REITH and R J ANDRES
Textile Fibers Dept
E I du Pont de Nemours & Co, Inc

J E REITH

Laboratory studies for levelness and dyeing quality have been made on 8-inch strips of fabric three feet long of "Dacron" polyester fiber, "Orlon" acrylic fiber, and nylon in a closed Barotor machine at a temperature of 250°F with various dyestuff classes. To study dyeing rates, degrees of exhaustion and the behavior of mixtures of dyes, corresponding dyeings were made in closed rotating tubes at a temperature of 250°F. Amount of dye on a fiber was determined from spectrophotometric readings after complete solution of fiber and dye in suitable solvent.



R J ANDRES

INTRODUCTION

FOR dyeing fabrics under pressure not only must suitable machines be developed but also the behavior of dyes under conditions met in these machines must be studied. The excellent performance of the laboratory model of the Barotor led us to a program to obtain the data necessary for optimum results with this machine. Tonight I would like to present a progress report of this program for the dyeing of fabrics made from "Dacron" polyester fiber, "Orlon" acrylic fiber, and nylon.

EXPERIMENTAL

Before discussing dyes for each of these fibers, I shall describe the experimental procedures used. The data on the rate of dyeing, behavior of dyes in mixtures and the fastness properties were obtained from fabric samples dyed in tubes, which were rotated around their short axis in a glycerine bath heated at 250° F at a bath ratio of 50/1. Surface color was removed by repeated acetone rinses at room temperature until the acetone remained color-

* Presented by R J Andres at Kohler's Swiss Chalet in Rochelle Park, N J, on Sept 26, 1952.

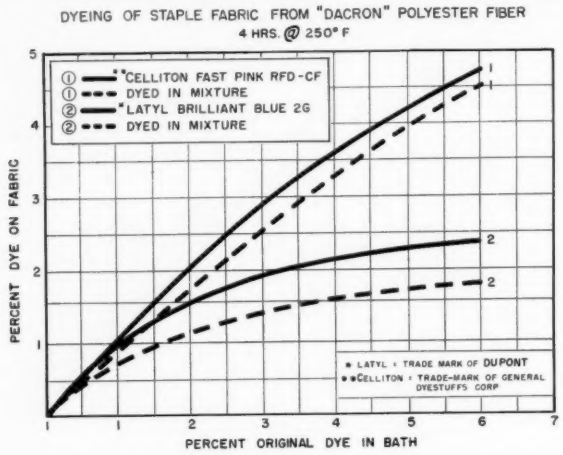

DYEING OF STAPLE FABRIC FROM "DACRON" POLYESTER FIBER
4 HRS. @ 250° F
① *CELLITON FAST PINK RFD-CF
① DYED IN MIXTURE
② *LATYL BRILLIANT BLUE 2G
② DYED IN MIXTURE
* LATYL = TRADE MARK OF DUPONT
** CELLITON = TRADE-MARK OF GENERAL DYESTUFFS CORP
PERCENT DYE ON FABRIC
PERCENT ORIGINAL DYE IN BATH

Figure 1

TABLE I
DYE PICK-UP ON FABRICS OF "DACRON" POLYESTER FIBER
4 HOURS AT 250° F
FILAMENT FABRIC

Original % dye in Bath:	*1%*	*3%*	*6%*
Dyestuff	*Per Cent Dye on Fiber*		
CELANTHRENE Violet BGF	0.95	2.05	4.35
ACETAMINE Orange GR 175%	0.80	2.20	4.65
Celliton Fast Pink RFD-CF	0.85	2.80	4.70
LATYL Brilliant Blue 2G	0.95	1.90	2.30
CELANTHRENE Brill Blue FFS 200%	0.70	1.65	3.65
Artisil Direct Blue GFL	0.75	1.70	3.00
CELANTHRENE Fast Yellow GL 300%	1.00	2.10	2.30
Eastman Fast Blue GLF	1.00	2.80	4.80
STAPLE FABRIC			
CELANTHRENE Violet BGF	0.95	2.15	4.25
ACETAMINE Orange GR 175%	0.80	2.15	4.25

(Du Pont Trade-Marks Are All in Capital Letters.)

TABLE II
STABILITY OF DYES ON FABRIC OF "DACRON" POLYESTER FILAMENT
FOUR (4) HOURS AT 250° F

Dyes (3% on Fiber at Start)	*Total Color on Fiber and in Bath as % Original Dye*
CELANTHRENE Violet BGF	100
ACETAMINE Orange GR 175%	100
Celliton Fast Pink RFD-CF	100
LATYL Brilliant Blue 2G	100
CELANTHRENE Brill Blue FFS 200%	100
Artisil Direct Blue GFL	85
CELANTHRENE Fast Yellow GL 300%	100
Eastman Fast Blue GLF	100
CELANTHRENE Pure Blue BRS 400%	70
ACETAMINE Rubine B	100

(Du Pont Trade-Marks Are All in Capital Letters.)

less. Fabrics were then dissolved in appropriate solvents and a spectrophotometer was used to determine the concentration at peak absorption. For assessing the levelness of the dyeings, tests were made with a three-foot-long strip eight inches wide by dyeing in the laboratory Barator at bath ratios of 100/1 to 150/1.

DACRON——Dispersed dyes selected for their fastness and affinity for "Dacron" polyester fiber were dyed in the presence of 1% "Duponol" D Paste on fiber weight at several dye concentrations for four hours at 250° F in dye tubes. Preliminary experiments had shown that a four-hour dyeing period was sufficient to give equilibrium dyeing with most of the dyes on the fibers studied. Although the fraction of color exhausted fell off as the concentration in the dyebath increased, saturation had not been reached even with 6% dye in the bath, as shown by the data of Table I.

In Figure 1 it will be observed that when two dyes are present in the same bath, their distribution between bath and fiber is only slightly different from that observed when they are dyed individually. Thus, dispersed dyes behave approximately as would be expected from a solution mechanism and should exhibit no blocking effect.

Stability of dyes for "Dacron" polyester fiber is listed in Table II. Concentration of dye on the fiber and in the bath after completion of the dyeing were determined with a spectrophotometer and the sum compared with the original quantity. Most dyes are very stable under these conditions, but less stable when a considerable quantity remains for a long period in the dyebath.

Hours for break as a measure of light fastness for 2% dyeings are given in Table III. This shows the improvement of high-temperature dyeings compared with those dyed at 212° F in the presence of 2% benzoic acid solution followed by scouring.

Some of these dyes were also applied in the laboratory Barotor at 250° F for four hours and compared with commer-

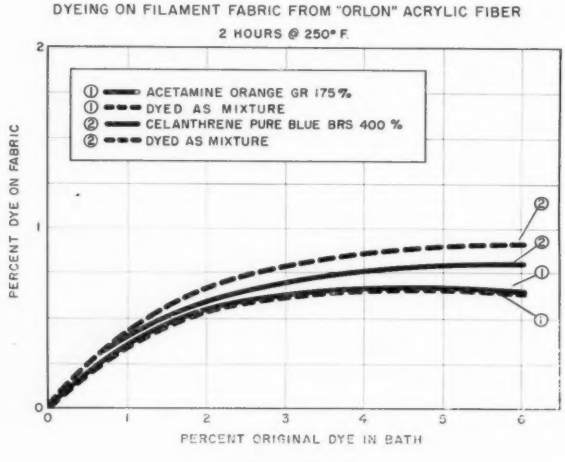

DYEING ON FILAMENT FABRIC FROM "ORLON" ACRYLIC FIBER
2 HOURS @ 250° F
① ACETAMINE ORANGE GR 175%
① DYED AS MIXTURE
② CELANTHRENE PURE BLUE BRS 400 %
② DYED AS MIXTURE
PERCENT DYE ON FABRIC
PERCENT ORIGINAL DYE IN BATH

Figure 2

TABLE III
LIGHT FASTNESS OF DYES ON "DACRON" POLYESTER FILAMENT DYED AT 250° F VS 212° F

Dyes (2% on Fiber)	250° F Fade-Ometer Hours to Break	212° F Plus Assistant* Fade-Ometer Hours to Break
CELANTHRENE Violet BGF	40-80	20-40
ACETAMINE Orange GR 175%	20-40	10-20
Artisil Direct Blue GFL	20-40	20-40
ACETAMINE Rubine B 125%	5-10	5-10
LATYL Brilliant Blue 2G	80-160	80-160
LATYL Blue 3R dbl paste	20-40	20-40
CELANTHRENE Fast Yellow GL 300%	80-160	80-160
Eastman Fast Blue GLF	40-80	40-80
Celliton Fast Pink RFD-CF	20-40	10-20

(Du Pont Trade-Marks Are All in Capital Letters.)

* 2% Benzoic Acid in the Bath.

TABLE IV
DYE PICK-UP ON "ORLON" ACRYLIC FIBER 4 HOURS AT 250° F

Original % Dye in Bath:	1%	3%	6%
Type-41 "Orlon"	% Dye on Fiber		
Du Pont Fuchsine Conc Powder	0.80	1.30	1.45
Du Pont Methylene Blue ZX	...	1.20	1.60
CELANTHRENE Pure Blue BRS 400%	0.80	2.00	2.60
ACETAMINE Orange GR 175%	0.65	1.60	1.80
Type-81 "Orlon"			
Du Pont Fuchsine Conc Powder	0.30	0.80	0.60
Du Pont Methylene Blue ZX	...	1.20	1.55
CELANTHRENE Pure Blue BRS 400%	0.40	0.60	0.80
ACETAMINE Orange GR 175%	0.30	0.60	0.65

(Du Pont Trade-Marks Are All in Capital Letters.)

TABLE V
DYE PICK-UP ON NYLON FILAMENT FABRIC 4 HOURS AT 250° F

Original % Dye in Bath:	1%	2%	3%	4%	6%
Dyes	Per Cent Dye on Fiber				
Du Pont Anthraquinone Blue SWF 150%	1.00		2.10		3.10
Du Pont Milling Red B Conc	1.00		2.40		2.60
PONTAMINE Yellow CH Conc	1.00		1.90		2.10
PONTAMINE Fast Orange 2 GL	.90		3.10		4.60
Du Pont Anthraquinone Green GN	1.00	2.00	2.65	2.90	3.50
Du Pont Anthraquinone Blue RXO	1.00	1.90	2.55	2.80	2.95
Du Pont Anthraquinone Violet 3R	1.00	1.90	2.15	2.25	2.30
CHROMACYL Bordeaux R	1.00	2.00	2.80	3.50	4.25
PONTAMINE Fast Red 8 BL 125%	1.00	1.50	1.70	1.90	2.00

(Du Pont Trade-Marks Are All in Capital Letters.)

TABLE VI
LIGHT FASTNESS OF DYES ON NYLON DYED AT 250° F VS 212° F

Dye (2% on Fiber)	250° F Fade-Ometer Hours to Break	212° F Fade-Ometer Hours to Break
Du Pont Anthraquinone Blue SWF 150%	20-40	10-20
Du Pont Milling Red B Conc	20-40	10-20
Du Pont Anthraquinone Blue RXO	20-40	10-20
PONTAMINE Fast Orange 2 GL	20-40	10-20
Du Pont Anthraquinone Green GN	20-40	10-20
PONTAMINE Yellow CH Conc	40-80	
PONTAMINE Fast Red 8 BL 125%	20-40	
CHROMACYL Bordeaux R	20-40	
Du Pont Anthraquinone Violet 3R	20-40	

(Du Pont Trade-Marks Are All in Capital Letters.)

cial jig dyeings for sixteen hours. Covering of warp streaks was considerably better at 250° F, the yellows, reds, and Latyl Brilliant Blue 2G dyeings being commercially acceptable.

By dyeing fabrics of "Dacron" polyester fiber at 250° F, lower chemical costs may be realized by the elimination of carriers and better quality as evidenced by improved levelness and light-fastness obtained. A full shade range is available at this temperature without the complication of incompatibility in mixtures.

ORLON——By similar techniques, fabrics of "Orlon" acrylic fiber have been dyed with other colors. On fabrics of type-81 "Orlon" acrylic fiber, colors build up slowly, but dye in mixtures as they do individually. Table IV shows the dye pickup for various dispersed and basic colors. Figure 2 shows the behavior of a mixture. On type-41 "Orlon" acrylic fiber a similar situation exists except for the better affinity of dispersed dyes for the latter as shown in Figure 3.

Only a few basic dyes have been examined thus far. The rate of dyeing is markedly faster at 250° F than at 212° F, but the depths obtainable are not significantly different when dyed to equilibrium. For practical conditions, however, deeper shades are obtainable by dyeing at 250° F compared with 212° F.

The difficulty of control of pH and electrical potential has prevented successful dyeing of fabrics of "Orlon" acrylic fiber with acid dyes by the copper method in dye tubes. As a result we have not yet obtained quantitative data for this method at 250° F. The advantages already known for yarn and raw-stock dyeing of better exhaustion, better fastness and the use of cheaper dyes for deep shades carry over to fabric dyeing of type-41 "Orlon". Slower exhaustion with type-81 requires that the more stable dyes be used for it.

Fabrics of "Orlon" acrylic fiber can thus be dyed advantageously at 250° F to obtain better fastness and wider selection of dyes. Most important, however, is the absence of kettle marks or dye streaks because the fabric is maintained in open width throughout the dyeing.

NYLON——For many uses the dyer would like very much to use acid dyes for nylon fabrics, particularly where wash fastness is required. But the use of this class has been restricted because of the difficulty of obtaining deep, level shades on jigs or becks. Improvements are available at 250° F since milling and direct dyes may then be applied and can build up to fairly heavy shades.

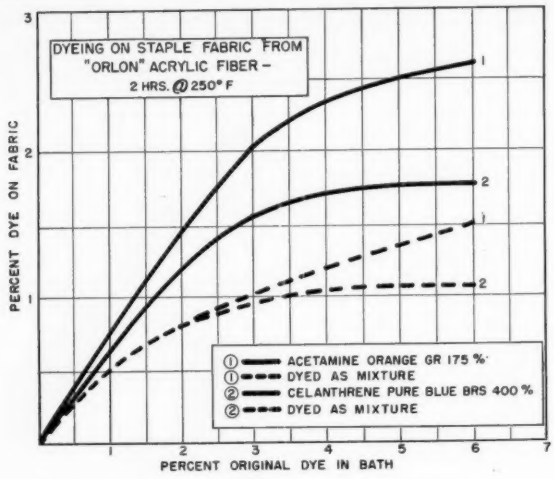

DYEING ON STAPLE FABRIC FROM "ORLON" ACRYLIC FIBER – 2 HRS. @ 250° F
PERCENT DYE ON FABRIC
PERCENT ORIGINAL DYE IN BATH
① ACETAMINE ORANGE GR 175 %
① DYED AS MIXTURE
② CELANTHRENE PURE BLUE BRS 400 %
② DYED AS MIXTURE

Figure 3

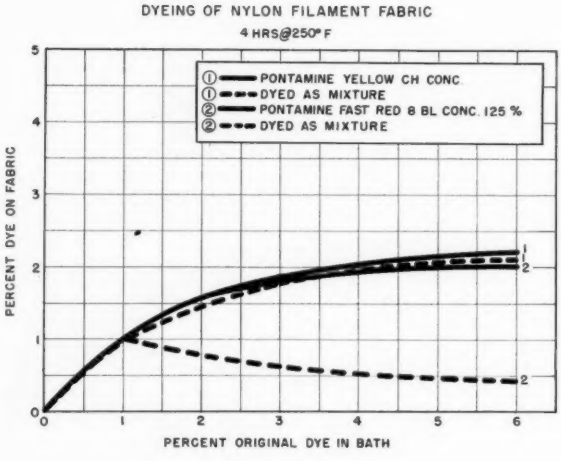

DYEING OF NYLON FILAMENT FABRIC
4 HRS@250° F
PERCENT DYE ON FABRIC
PERCENT ORIGINAL DYE IN BATH
① PONTAMINE YELLOW CH CONC.
① DYED AS MIXTURE
② PONTAMINE FAST RED 8 BL CONC. 125 %
② DYED AS MIXTURE

Figure 4

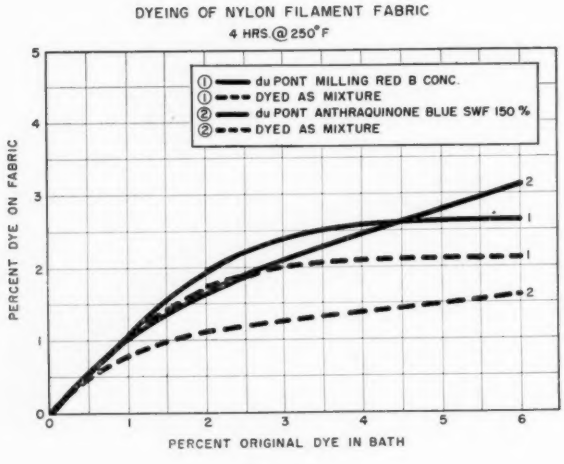

DYEING OF NYLON FILAMENT FABRIC
4 HRS @ 250° F
PERCENT DYE ON FABRIC
PERCENT ORIGINAL DYE IN BATH
① du PONT MILLING RED B CONC.
① DYED AS MIXTURE
② du PONT ANTHRAQUINONE BLUE SWF 150 %
② DYED AS MIXTURE

Figure 5

Table V shows the pickup at 250° F of various acid and direct colors on nylon. These dyes show better leveling properties at 250° F than at 212° F. For example, experimental fabrics containing elongation junctions which showed up as bands in jig dyeings were covered with these dyes at 250° F. Their compatibility in mixtures is illustrated in Figures 4 and 5. Thus, color selection to obtain mixtures that are compatible is also a problem at 250° F. However, the wider choice of dyes should be an advantage.

Light fastness of nylon dyeings with 2% dye made at 250° F is better for many dyes than those at 212° F, as shown in Table VI. In most cases pressure dyeing also increases the brightness of acid and direct colors on nylon and improves wash-fastness, particularly as shown by staining. Pressure dyeing of nylon fabrics with acid dyes thus results in better levelness, wider selection and increased fastness and brightness of dyes.

CONCLUSION

In conclusion, the availability of pressure dyeing equipment for fabrics will decrease the problems of "Dacron" polyester fiber, "Orlon" acrylic fiber and nylon by making deeper shades available at lower chemical cost and better fastness. Levelness is improved for both filament and staple fabrics. Rapid dyeings, which take advantage of savings in time at 250° F are now possible because all parts of the fabric are rapidly and repeatedly exposed to the dyebath in the Barotor. We intend to continue the studies that have been reported here in a preliminary manner in order to develop complete patterns of behavior for the important dye classes at various temperatures on the newer fibers.

QUESTIONS

Question: What is the policy of Du Pont with respect to the manufacture of the Barotor?

Answer: Patent applications have been made for the Barotor, and licensing arrangements with several machine manufacturers are in negotiation. Their names are available to anyone who is interested.

Q: Most of your dyeings were made at four hours, a length of time which I assume was used to attain equilibrium. What is the practical dyeing time that you would normally use?

A: Although four hours' dyeing time was used to attain full theoretical equilibrium, practical exhaustion is obtained for most shades in one hour or less. Practical dyeing time on a large scale for good exhaustion is therefore one-half to one hour.

DYES FOR "ORLON" AND THEIR APPLICATION*

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Dyes and Chemicals Division
E I du Pont de Nemours & Co, Inc

The dyeing of Type 41 "Orlon" acrylic fiber, which has much more affinity than Type 81, is covered rather fully in four parts with illustrative recipes: 1) acid dyes at the boil, 2) acid dyes above the boil, 3) indigo and selected vat dyes at the boil, and 4) basic dyes above the boil. The techniques of carrying out these procedures (including the use of carriers, copper ion, high temperatures and pressures), relative fastness properties (especially light, washing and rubbing), quality and depth of dyeing, and relative costs are discussed for the various methods and dye classes. The best results thus far are obtainable with acid dyes at 250° F under pressure in the presence of cuprous ion, which is economically produced from blue vitriol by reduction with sodium bisulfite.

INTRODUCTION

At the present time, the chief interest in dyeing "Orlon" is that of dyes and methods for the staple form of the fiber, which will be produced in much greater amount than Type 81 filament yarn. Therefore, this paper will emphasize the dyeing of Type 41 "Orlon" staple.

First, let us have an understanding of the differences in dyeability between two forms of "Orlon" acrylic fiber. The principles of dyeing "Orlon", described in a previous paper, apply to the filament yarn as well as to staple fiber. However, Type 81 filament yarn is a more highly oriented fiber than Type 41 staple and it is more difficult to dye. Differences in dyeability are based on the physical concept that the higher degree of orientation in the filament yarn prevents easy access of dyes when applied at the boil and requires high-temperature dyeing to achieve good results. On the other hand, the staple fiber is more easily penetrated at the boil, but, even in this case, higher temperatures are beneficial.

In order to simplify this subject as much as possible, the dyeing of "Orlon" staple will be divided as follows:

I—Acid dyes at the boil
II—Acid dyes above the boil
III—Indigo and selected vat dyes at the boil
IV—Basic dyes above the boil

I—ACID DYES AT THE BOIL

"Orlon" staple is dyeable in a full range of shades with selected acid dyes by the cuprous-ion method. Dyeing conditions, however, play a very important role in determining the degree of fastness obtained. Blaker and Laucius have shown *(1)* that the absorption of cuprous ions by the fiber is comparatively low at temperatures under the boil. Also, the effect of aeration on the reducing potential of the dyebath must be taken into account. Therefore, the degree of dye absorption and pentration is dependent on conditions in the various types of dyeing equipment.

Table I illustrates the rather sharp differences in temperature conditions found in the important types of equipment for dyeing "Orlon" staple.

At present, this fiber is being dyed in the staple form with satisfactory fastness properties for many uses, e g, for blending with wool in the production of woolen-type fabrics. In the simplest case, that of dyeing staple in open tubs, there is very little difficulty in obtaining a complete range of shades. However, the fastness of deep shades to perspiration, fulling, steaming and washing is not satisfactory because of the low dyeing temperature, 200° F. Even the carriers, such as phenol or orthophenylphenol, which improve build-up of acid dyes on "Orlon" acrylic fiber, do not yield good fastness.

The second case, dyeing in circulating stock or package dyeing machines, produces considerably better wet fastness, but the deeper shades are still deficient in perspiration and steaming fastness. It should be mentioned, however, that shades in the medium-to-heavy range, such as Marine Green, dyed in conventional circulating machines, are being used successfully. In assessing the value of such dyeings, one must always consider the end use. If the proportion of "Orlon" in the blend is small, then some fastness requirements can be modified. On the other hand, where subsequent finishing processes, such as decating, crabbing, or fulling in acid, impose stricter fastness requirements, then these boil dyeings may not be satisfactory.

The same comments apply to our next case, the dyeing of "Orlon" tops. In conventional-type machines, the maximum temperature (205° F) is a little lower than that obtainable in most stock machines. Tops of "Orlon" are steamed prior to dyeing in order to preserve the crimp of the fiber. Generally speaking, good wet fastness properties in the heavy shades are not obtained in the present machines.

The dyeing method for "Orlon" acrylic staple and top is quite simple. After a scouring with water at 180° F, copper sulfate crystals are added to the machine at 140° F, the temperature is raised to 180° F, the dyes are added and then hydroxylammonium sulfate is added slowly at 200° F. The material is dyed for one hour at the maximum temperature of the machine and then it is rinsed and scoured. If it is necessary to make additions, the bath is cooled to 190-200° F. Scouring is important to insure the best wet fastness. It is usually carried out at 180° F with

TABLE I
EQUIPMENT FOR DYEING "ORLON" ACRYLIC STAPLE

	Maximum Temperature °F	*Volume Ratio*
Stock Dyeing—Open Tubs	200	30-40:1
Stock Dyeing—Circulating Machines	208	10-20:1
Top Dyeing Machines	205	20-30:1
Package Dyeing Machines	208	6-10:1
Dye Kettles or Becks	212	30-60:1

* Presented at the Swiss Chalet, Rochelle Park, N J, on Sept 26, 1952.

1.0% "Duponol" D Paste for fifteen minutes. Refinements of this technique, using instrument controls, have been described by Dr Blaker.

COLOR RECOMMENDATIONS FOR BOIL DYEING——A great number of dyes of the acid and direct color classes have been evaluated for dyeing "Orlon" and a careful selection has been made based on important fastness properties and exhaustion rates. From the existing range of acid colors, Du Pont Quinoline Yellow PN, Du Pont Orange II Conc, Du Pont Orange RO, "Pontacyl" Fast Red AS Extra Conc, Du Pont Anthraquinone Blue SWF Conc 150%, and Du Pont Anthraquinone Blue RA were chosen for their all-around good fastness and build-up properties. Many other dyes, which are of interest for light shades only because they fail to build-up properly, include the following:

Du Pont Neutral Brown BGL
Du Pont Neutral Gray L
Du Pont Anthraquinone Green GN

Despite the fact that very good light fastness is obtainable with available acid dyes in the medium to heavy shade range, the Du Pont Company has recognized the need for improved light fastness in the pastel to medium-shade group. Consequently, a new group of colors, known as the "Roracyl" dyes, has been developed for "Orlon". Four members of this group have been made available on a commercial scale, namely:

New Name	*Experimental Name*
"Roracyl" Orange R	Acid Orange P-40
"Roracyl" Violet 2R	Acid Violet P-46
"Roracyl" Dark Green B	Acid Green P-45

"Roracyl" Dark Brown B

These new dyes have outstanding fastness to light and wet fastness on "Orlon". Currently they are being used to advantage for light shades on "Orlon" acrylic staple that is blended with wool, on piece-dyed staple fabrics and on brushed filament goods of "Orlon" used for wearing apparel. The "Roracyl" dyes, along with Du Pont Quinoline Yellow PN and Du Pont Anthraquinone Blue SWF, provide a good range of light shades on "Orlon" having outstanding fastness properties.

II—ACID DYES ABOVE THE BOIL

The development of techniques for dyeing "Orlon" staple at high temperatures under pressure has changed the outlook on the dyeing problem tremendously. The advantages of high-temperature dyeing outweigh by far any of the possible objections to mill-scale operations at raised temperatures and pressures. Today, there are several mills in production on "Orlon" staple, spun-staple yarns and filament yarns; many more mills are in the process of making the necessary minor changes in available equipment or procuring new equipment for high-temperature dyeing.

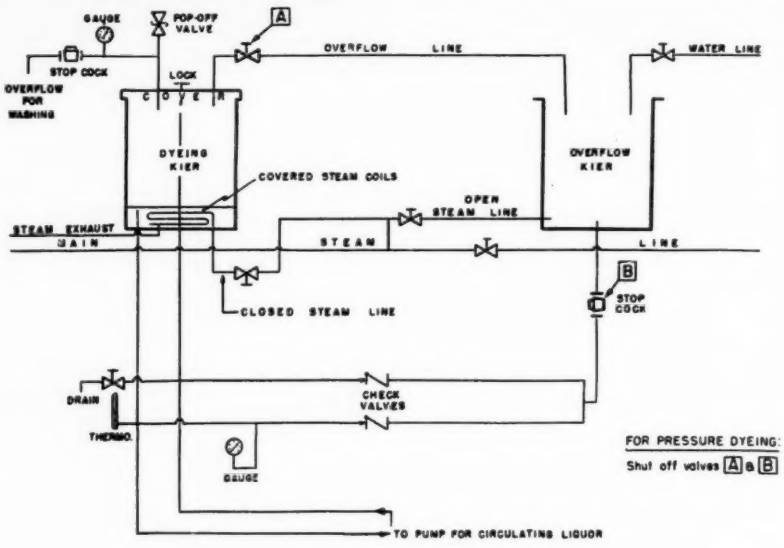


Figure 1
Smith, Drum 1-lb Package Machine

Figure 1 shows a schematic drawing of a package machine in which is illustrated the simple changes required for this type of operation. This also applies directly to circulating stock dyeing equipment. Providing such minor changes can be made, and the equipment is sturdy enough, several existing types of yarn and stock circulating machines can be used. In addition, we are working with a number of top dyers on the design of suitable equipment for handling this form of "Orlon" acrylic staple under pressure.

Besides improving the exhaustion and general wet fastness properties of the boil-dyeing acid colors, high-temperature dyeing at a maximum temperature of 250° F allows the use of many additional dyes which are not applicable at 212° F. These include the Du Pont Milling Reds, "Pontacyl" Fast Black N2B, Navy Blue M4B, several additional Anthraquinone Blues, the Resorcin Browns, certain direct dyes, such as "Pontamine" Fast Orange 2GL, and much improved build-up and usefulness of the Neutral Gray L, Neutral Brown BGL and Du Pont Anthraquinone Green G. Potentially, "Orlon" is dyeable with a very large number of dyes at high temperatures.

Since combinations of Anthraquinone Blue and Quinoline Yellow plus other shading elements must be used at the boil, medium to heavy shades are quite expensive, ranging in dye cost alone between 40 and 50 cents per pound of fiber dyed. Compared with this, the same shades applied at 250° F with cheaper colors cost from 10 to 18 cents per pound of fiber.

The second major saving in cost of dyeing is that of the reducing agent. Hydroxylammonium sulfate is the most efficient and safest material for dyeing at the boil. Its price is 70 cents per pound. For dyeing at 250° F a number of cheaper reducing agents may be used, the most noteworthy being sodium bisulfite at about five cents per pound. Furfural and glyoxal are also cheaper than hydroxylammonium sulfate and they are quite effective, but the present dyeing technology indicates that sodium bisulfite will be the preferred agent. While it has been known to cause pitting of Type 304 stainless-steel equipment, our research has demonstrated that this pitting is effectively eliminated by the use of sodium nitrate as a corrosion inhibitor.

The final, but certainly not the least important, advantage for high-temperature dyeing is that of improved fastness. We have pointed out the problem of obtaining maximum fastness to perspiration, steaming, cross dyeing and other processing steps in connection with dyeing raw stock and top at boiling temperatures. When the temperature of dyeing is raised to 250° F, and advantage is taken of the wider selection of dyes available for appli-

cation at high temperatures, greatly improved fastness properties are attainable. For example, "Pontacyl" Fast Black N2B shaded with Du Pont Quinoline Yellow PN yields a good black shade which withstands the most rigorous requirements. It is completely fast to cross dyeing with wool colors and fast to carbonizing, crabbing, fulling, perspiration, and even cotton washing tests. On the other hand, combinations for black shades based on Du Pont Anthraquinone Blue SWF, dyed at 205-208° F, besides being much more expensive, are not fast to perspiration, washing, steaming, etc.

The procedure for high-temperature dyeing with sodium bisulfite as the reducing agent is illustrated by the following run on "Orlon" acrylic staple in a circulating machine. (All percentages are based on weight of fiber, owf).

Scour at 160°F for 15 minutes with 2.0% of ammonia (28%).
Drop the scour bath and refill machine with water at 120°F.
Add 6.0% copper sulfate crystals and 0.5% sodium nitrate.
Raise temperature to 180°F.
Add dye—8.0% "Pontacyl" Fast Black N2B Conc 200%
0.75% Du Pont Quinoline Yellow PN Extra Conc.
Raise temperature to 200°F.
Add 1.5% sodium bisulfite and run 10 minutes.
Pressurize machine at once, raising temperature to 250°F as rapidly as possible.
Run one hour at 250°F.
Cool to 160°F and rinse.
Scour at 180°F for 15 minutes with 1.0% "Duponol" D Paste.
Rinse.

Furfural and glyoxal have also been used successfully as reducing agents for high-temperature dyeing.

Fabrics made of "Orlon" staple are dyed in closed dye kettles or becks. A variety of light and dark shades have been dyed by the cuprous-ion method with acid dyes at 208-210° F. In addition to the cuprous ion, dye assistants such as phenol, paraphenylphenol or ortho-phenylphenol are required to obtain practical exhaustion rates in medium to heavy shades. There is also some evidence that phenol, used in the application of light shades, has a leveling effect, possibly because it promotes dye-transfer to some extent.

In order to produce acceptable piece dyeings, yarn-processing steps and fabric preparation must be controlled. Experience has shown that irregularities in tension and heat during the preparation of the fabric will appear as dye junctions or warp streaks.

In piece-goods dyeing, the importance of obtaining a uniformly high temperature throughout the machine cannot be overemphasized. Usually, additional steam lines are required in the conventional machines. If the temperature drop from front to back is too great, a steam line is inserted in the rear section. Installation of this line is feasible on rayon becks, but it is not often needed on dye kettles. Whether or not the second steam line under the liquor is installed, it is more important to place an open steam line across the top of the machine above the reel. With proper baffles to drain off any condensate to the sides of the cover, this steam fills the machine, maintaining maximum temperature above the liquor and optimum temperature in the liquor throughout the machine. Considering the fact that the cuprous-ion dyeing system is sensitive to aeration, the steam atmosphere thus created serves to exclude air, giving added assurance of successful dyeing.

The procedure for piece dyeing follows:

40:1 liquor ratio	
sulfuric acid	—1 oz/100 gal
copper sulfate crystals, owf	—1-2% for light shades 4-5% for medium to dark shades
* phenol (90%)	—3.5 lb/100 gal
"Alkanol" WXN	—1 oz/100 gal
hydroxylammonium sulfate	—40 parts/100 parts $CuSO_4.5H_2O$

* Used in medium and dark shades. Paraphenylphenol or similar phenolic compounds are required for black, at a concentration of 1½ lb/100 gal. For black, the copper sulfate is increased to 6-8%, owf.

PRESCOURING —— The fabric is boiled off in the open width and then relaxed for a period of approximately 5 minutes. A nonionic detergent is preferred at a concentration of 0.5 lb/100 gal for scouring. The fabric is transferred wet to a dye beck and washed for 15 minutes at 160° F with 4 oz/100 gal of "Calgon". The fabric is then cooled by dropping half the liquor and refilling. This bath is dropped and the goods are given a short cold rinse.

DYEING——The dyebath is set at 120° F with sulfuric acid-copper sulfate solution added, followed by the phenol and "Alkanol" WXN separately. Color is added at 140° F. The bath is then raised to 180° F, whereupon addition of hydroxylammonium sulfate (as a cold-water solution) is started and carried out over a period of 45 minutes. The boil is reached in approximately 20 minutes after the first addition of hydroxylammonium sulfate. Sampling of the batch is done after one hour in the case of light shades, and after one and one-half hours in the case of dark shades. The bath should be cooled to a temperature between 195-200° F for color additions. Samples taken for correction of shade may be made after reheating to the boil and running for a period of 20-30 minutes. It is sometimes necessary to add a proportionate amount of hydroxylammonium sulfate during shading, particularly after two hours dyeing time.

The use of the dye assistants previously mentioned greatly increases the build-up properties of the selected acid dyes. The rate of dyeing is also increased, with phenol being slower than p-phenylphenol. This slower rate with good build-up is the reason for its general preference. However, if phenol is not acceptable because of stream contamination, the following phenolic compounds may be used:

1) "Purasist" RA—Gallowhur Chemical Co. (a dispersible powder of p-phenylphenol)
2) "Dowicide" A—Dow Chemical Co. (soluble) (water-soluble o-phenylphenol sodium salt)

The dyeing procedure is generally similar to that for phenol, except that the soluble product must be regenerated in the dyebath to be effective. This is done with suitable additions of acid. The dispersible product can be added directly to the boiling bath and dyeing started by the addition of hydroxylammonium sulfate. These products require a concentration in the dyebath of 0.75 to 2.0 lb/100 gal of dye liquor.

SCOURING AFTER DYEING——The dyebath is cooled by the half-liquor procedure previously described in the prescouring operation. This is followed by a rinse at 140° F in a fresh bath. The fabric is then given a 15-minute wash at 160° F with1% "Duponol" D Paste owf. The use of alkali should be avoided in the final scour. After scouring, the usual rinses to clear are given.

STEEL BALL TECHNIQUE FOR MINIMIZING ROPE MARKS——Like most synthetic polymers, "Orlon" is somewhat thermoplastic. Certain fabrics develop rope marks under the influence of heat during dyeing over the reel. In order to open up the material and prevent its riding continuously in the same position, the technique of tacking the fabric and placing a steel ball in the tube thus formed has been employed. The steel ball is partially filled with water to allow it to float partly submerged. Initial mill trials have been quite successful.

COLOR RECOMMENDATIONS FOR FABRIC MADE OF 100% ORLON ACRYLIC STAPLE——In connection with the dyeing of "Orlon" staple and tops at the boil, we pointed out that wet fastness properties, such as washing, perspiration and steaming, for heavy shades are often unsatisfactory. It will be recalled that the maximum temperatures reached in conventional stock and top dyeing machines is in the range 205-208° F. Therefore, in considering the question of fastness properties of piece goods of "Orlon", we should keep in mind that the maximum temperature of the dye liquor in tightly covered uniformly heated kettles or becks is in the range 208-212° F.

By the use of the same group of acid

dyes recommended for dyeing staple and top at the boil, fabrics of "Orlon" acrylic staple have been beck-dyed in a full range of shades exhibiting very good fastness to light, crocking, washing, dry cleaning and perspiration. The new "Roracyl" dyes for "Orlon" play an important role by providing good light fastness in light shades. It is believed that the greatly improved perspiration and washing fastness of such fabric dyeings over similar shades on stock and top is the result of dyeing at higher temperatures and, possibly, the effect of more efficient contact of dyeing and washing liquors with the material.

III—APPLICATION OF INDIGO AND SELECTED VAT DYES

A new method for the application of indigo and certain vat dyes on "Orlon" has been developed. Whereas all previous attempts to dye "Orlon" with indigo resulted in weak shades having quite poor fastness to light and crocking, the new technique has produced deep navy shades approaching the shade of indigo on wool. Most important of all is the high degree of fastness obtained. With light fastness of 80 to 160 Fade-Ometer hours, excellent washing and perspiration, and good crocking fastness, dyeings of indigo on "Orlon" promise to be of considerable importance in the future.

The following procedure, describing a two-piece run of 100% "Orlon" in a closed dye beck, will serve to illustrate the process:

For 100 Lb of Fabric Made of 100% "Orlon"

Volume—4,000 lb water (500 gal)

Pounds	
30	Du Pont Indigo PLN Paste
20	sodium bisulfite
4	"Sulfoxite" C
2	"Duponol" D Paste
	Starting pH, 5.0

Color and chemicals are added to the cold bath, temperature is raised to the boil and held for five to fifteen minutes to effect reduction of the indigo to a light, greenish-yellow acid leuco. At this point, an additional amount (0.5-1.0 lb) of "Sulfoxite" C might be required to complete the reduction. With the overhead steam line on, the dyeing is continued for 1½ to 2 hours at about 210° F. The dyeing is oxidized, without changing the bath, by adding 15 to 20 lb "Albone" C and boiling for 15 minutes. (If the dyebath is dropped, oxidation is accomplished in a fresh bath by the use of 5 to 10 lb of "Albone" C for 15 minutes at the boil.) The oxidation bath is dropped and the material is rinsed and scoured with

20 lb sodium carbonate
10 lb sodium hydrosulfite
2 lb Duponol D Paste

in 4,000 lb of water at 140-160° F for 15 minutes.

Although our experience is limited to piece dyeing, we believe that the process will be applicable to stock, top, and yarn. One point should be stressed, however. At the end of the dyeing, the material must be scoured with hydro and soda ash to remove surface pigment for improved crocking fastness. It is believed that this might be done satisfactorily in circulating equipment, but thus far it has not been demonstrated.

Selected vat colors of the thioindigoid class have been used to shade indigo dyeings. We are able to report that interesting laboratory results have been obtained in demonstrating, for example, the use of "Sulfanthrene" Brown G Paste to shade Du Pont Indigo PLN Paste to a fairly good black.

In this case, a one-bath, two-step procedure is used. "Sulfanthrene" Brown G Paste—12% based on fiber weight, is dyed on the "Orlon" from a sodium carbonate-hydrosulfite bath, then the pH is adjusted to 5.0 by addition of acetic acid, and indigo is applied as the acid leuco.

IV—BASIC DYES ABOVE THE BOIL

The affinity of basic dyes for "Orlon" acrylic fiber is relatively low but their tinctorial value is quite high. Medium shades can be applied at the boil and deep shades are obtained at temperatures above the boil. The procedure for dyeing with basic colors is very simple: A solution of the dyes is made with acetic acid and dyeing is carried out simply by treatment at the required temperature. No assistant, copper ion or other material is needed.

The wet fastness of basic dyes on "Orlon" is excellent, and the light fastness in several cases is fairly good. This is somewhat surprising since the basic dyes have limited textile use because of their poor light fastness on other fibers, such as wool, nylon and silk.

There are two serious limitations to the use of basic dyes at 212° F. One is that they accentuate any dyeability variations in materials of "Orlon", and the other is their lack of build-up at this temperature.

On the other hand, dyeing under pressure at high temperatures improves build-up and light fastness and diminishes dyeability differences.

In terms of light fastness, the outstanding basic dyes are Du Pont Fuchsine N, which is a red, Du Pont Brilliant Green Crystals and a new yellow basic dye now under development, coded Basic Yellow P-81-A. The Fuchsine and Brilliant Green have about 20 to 40 hours Fade-Ometer light fastness and Yellow P-81-A is rated at 40 hours. Du Pont Crystal Violet and Methylene Blue are also useful in making many of the compound shades of gray, green, brown and navy.

Continued research in the basic color field promises to provide additional dyes of outstanding light fastness.

Basic dyes are being used on Type 81 "Orlon" filament yarns in package dyeing at 250° F in pressurized machines. "Orlon" staple knitwear, such as men's half hose and sweaters, have also been dyed on an experimental scale in mill equipment at high temperature. It is anticipated that pressure dyeing of other forms of piece goods may be carried out with basic dyes when suitable equipment is available.

FILAMENT YARN AND SEWING THREAD——In the dyeing of Type 81 "Orlon" filament yarn the high-temperature dyeing method at 250° F with acid dyes and basic dyes is showing great promise. By selecting dyes from these two classes an entire range of shades is available. Filament yarns dyed in this manner are being used in sewing threads, as colored effect yarns in piece-dyed suitings, hosiery and in bathing suits.

FILAMENT FABRICS—— Satisfactory dyeings in light and medium shades can be obtained on fabrics of "Orlon" continuous filament by the cuprous-ion method provided the fabrics are constructed so as to hide yarn defects and be dyeable in a beck. In this category are certain tricot knit fabrics, brushed fleece fabrics, and some of the combination fabrics. However, there is no entirely satisfactory method for dyeing normal plain-weave fabrics in light and medium shades because yarn nonuniformities cannot be covered by any class of dyes having acceptable fastness.

There are two applications of dyes for fabrics of "Orlon" filament of this type which appear to be satisfactory: one is the application of heavy shades for auto-top fabrics by the use of acid dyes applied by the cuprous-ion method, and the other application is dyeing with resin-bonded pigments, which yield level dyeings in light to medium shades. However, the latter dyeings are generally not suitable for apparel use because they are not fast to abrasive washing, such as is encountered in hand laundering.

Research is active on methods for improving the dyeing of fabrics of "Orlon" filament. Pressure dyeing in the Barator, which will be described later, has shown some promise and has yielded level dyeings of good fastness on taffeta fabrics

in heavy shades. Other approaches to this problem are being actively followed.

SUMMARY

The development of pressure dyeing at high temperatures has made it possible to dye "Orlon" acrylic staple in rawstock, top and yarn form with acid colors having fastness properties on this fiber comparable to the best dyes on wool. The outstanding advantages of high-temperature dyeing, lower dye and chemical cost, wider selection of dyes and improved fastness properties, compared with dyeing under atmospheric pressure at the boil, have been described.

Fabrics made of 100% "Orlon" acrylic staple can be dyed with satisfactory fastness by the cuprous-ion method with acid dyes in closed dye kettles or becks. Good fiber blending and attention to tension and heating effects on the fiber during processing to fabric must be practiced to produce material which can be dyed in level shades.

The new process of dyeing "Orlon" staple fabrics with indigo by the acid-leuco method has been described. Navy, and possibly black, shades will be applicable at much lower cost than similar dyeings made with combinations of acid dyes based on the relatively expensive Anthraquinone Blues.

Basic dyes, including the new light-fast Yellow P-81-A, are finding more and more important uses on "Orlon" staple and filament when applied at high temperatures under pressure.

"Orlon" filament yarns and sewing threads are dyeable at high temperatures with acid colors by the copper method and with basic dyes. With a wide selection of acid dyes available, top fastness properties on filament yarn are attainable, while good fastness and brilliance are available in the basic color class.

For the most part, "Orlon" filament fabrics still present formidable problems. Although relatively good fastness with acid dyes in light and medium shades can be obtained, the levelness of fabrics of 100% "Orlon" is unsatisfactory unless the fabric surface is modified by pattern effects or other means by which yarn to yarn irregularities are masked.*

* ACKNOWLEDGMENT —— The material presented in this paper has been developed as the result of the co-operative effort of many individuals in the Organic Chemicals and Textile Fibers Departments of the Du Pont Company.

REFERENCE

(1) Blaker, R H and Laucius, J F, *Am Dyestuff Reptr* 41, P39 (1952).

184th Council Meeting—

(Concluded from Page P31)

CORPORATE

Allied Chemical & Dye Corp
Alliance Color & Chemical Co
Berkshire Color & Chemical Co
Dyemaster Hosiery Finishing Corp
Federal Resinous Chemicals, Inc
General Rayon Silk Dyeing Corp
Malina Company
Mellin Chemicals, Inc
Morrison Machine Co
Sears, Roebuck & Co
E M Sergeant Pulp & Chem Co Inc
The Sherwin Williams Co

SENIOR

Adams, J R
August, C
Baillie, J A
Baker, N B
Ballard, R K
Barton, R E
Beck, H L
Brooks, R A
Callard, E
Calle, B L
Craig, H C
Darsey, R H, Jr
Dominici, H J
Duisberg, W H
Einstein, J V
Fearing, A
Fischer, G
Fogle, G E, Jr
Forney, T J
Friedman, M B
Gavitt, R H
Gibson, C F
Greenberg, S
Hall, H H
Hardy, A E
Harris, J N
Harris, W W, Jr
Harvey, C A
Holter, H
Irvine, R A, Jr
Israel, W M
Jefford, J D
Jones, M F
Kern, D W
Koek, K H
Kotyla, B C
Lagache, L L
Larson, O S
MacKenzie, N M
Maxwell, E S
Memmott, R B
Milius, L
Miller, B
Mogensen, A O
Newland, C
Oldfield, H P
Oldham, F A
Peake, J
Perkins, G C
Prucino, A A
Quinn, J L
Riley, P V
Rogers, G
Ross, J H
Rottschaefer, B W
Safstrom, C N
Sartorius, F C
Schaffling, O G
Schulze, F
Schwarze, E P
Shafter, S F
Sheehan, C E
Smart, R L, Jr
Speer, G W, Jr
Teale, R
Thevenson, A J
Troy, J F
Tschinkel, W H
Wessell, C R
Whiting, S H

JUNIOR

Bell, J C, Jr
Besmertnuk, E
Cowan, J C, III
Gruber, A H
Kearns, J F
Kornberg, A L
Moss, B B
Squier, W H
Taylor, J T
Theodos, P

ASSOCIATE

Breer, P E
Campbell, W P
Cosgrove, J T
Egan, C F
Fairbanks, M W
Hamilton, R J
Hirtle, R C
Hoesl, J E
Jacobs, R
McDonald, M C
O'Sullivan, C
Ouellette, G J
Quackenbush, W R
Schumacher, C P
Seigel, H D
Shaw, F
Sinclair, W B
Skilton, W F
Sposato, A T
Tierney, W
Wells, A E
Young, R M

STUDENT

Abrams, W G
Ayanoglu, K
Camacho, V G
Cavicchi, G J
Chang, Y C
Chartier, R A
Cyr, R A
Demuth, R C
Dodge, M A
Einstein, R J
Eren, A
Escolas, G R
Fonseca, A
Foster, W H, Jr
Gates, J W
Gifford, A E
Grime, R M
Hamel, N A
Hamilton, H R
Houghton, E E
Hunt, R T
Kennedy, W J, Jr
Latta, D J
Lewis, A F
McDonnell, J A, Jr
Morton, D S
Nicalek, J L
Patel, T P
Pelletier, A J
Petkiewicz, C J
Pierce, D I, Jr
Poitras, A H
Quealy, T S
Rassie, N T
Ricard, P C
Riley, C P, Jr
Rybka, J L
Scaringi, J H
Siddall, J H, Jr
Silva, J L
Smith, C A
Sugarman, J
Sutphin, H E
Torchia, D F
Ward, H G

TRANSFERRED FROM OTHER CLASSIFICATIONS TO SENIOR MEMBERSHIP

Adams, J A
Aurich, R F
Barg, A
Benischeck, J J
Bradley, W E
Ciesla, E T
Eckman, L R
Elwell, R E
Evans, J B
Gamble, D E
Glick, J S
Grundy, H G
Gurry, F H
Hilsman, Y G, Jr
Jacoby, J H
Kuhn, C R
Margolis, A W
Mercer, H L
Munz, W A
Nickerson, R E
Palen, R N
Peirent, R J
Perriello, R G
Rollins, N E
Rooney, A J
Rosner, C J
Scanlan, T R, Jr
Shippee, F B
Sikora, J E
Turner, D L
Whitehead, C A

Respectfully submitted,
H C CHAPIN, *Secretary*

W E Thompson to Speak at Next WNE Meeting

WALTER E THOMPSON, JR, Director of Research and Sales Promotion for Heminway and Bartlett Company, Watertown, Conn, will be guest speaker at the January 30th meeting of the Western New England Section to be held at Rapp's Restaurant, Shelton, Conn. Mr Thompson will discuss "High Pressure Dyeing of the Synthetic Threads with Emphasis on Polyacrylonitrile".

DECEMBER 12th MEETING WESTERN NEW ENGLAND SECTION

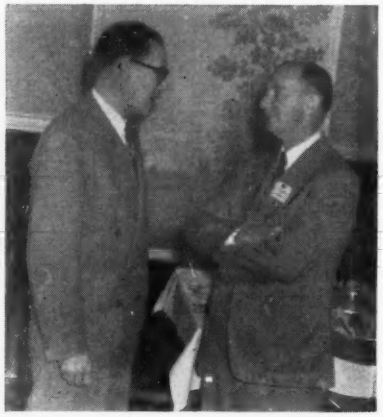
J E LYNN

At the Section's December 12th meeting, the resignation of Dr J.E Lynn, WNE Section Councilor, was read and accepted. His successor is Raymond J Carey, General Dyestuff Corp.

Dr Lynn's efforts in organizing and working with the Western New England Section were rewarded with its activation in 1948. For the past 10 years he has been director of the Textile Chemicals Laboratory of the American Cyanamid Company's Research Laboratories in Stamford, Conn. His new position will be with the National Gypsum Company, Buffalo, N Y, where he will be director of basic research.

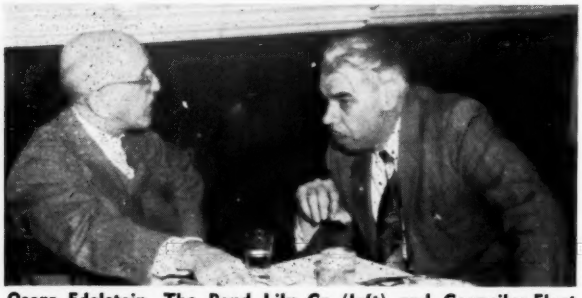
Western New England Section Officers for 1953 (L to r): Arthur S Nyquist, Vice Chairman; Socrates Vaniotis, Treasurer; Rudolph C Geering, Chairman; Nathaniel J Glade, Secretary; J Edward Lynn, Councilor-elect, who has since announced his resignation. Dr Lynn is succeeded in the post by Raymond J Carey.

H W Stiegler, AATCC Director of Research, Discusses the Accelerotor.



Chairman Rudolph C Geering, Princeton Knitting Mills (left) and Arthur Cresswell, American Cyanamid Company.

H W Stiegler, AATCC Director of Research, in a huddle with some WNE Section Members.



Oscar Edelstein, The Pond Lily Co (left) and Councilor-Elect Raymond J Carey.

ABSTRACTS

Recent Developments in Bleaching with Hydrogen Peroxide

W S Wood and K W Richmond, *J Soc Dyers Colourists* **68**, 337-44, September, 1952.

The developments discussed in this paper include bleaching of wool in acid solution, dyeing of wool after bleaching with alkaline solutions of hydrogen peroxide, bleaching of dark-colored wools, continuous bleaching of cotton and viscose rayon, bleaching of mixtures and unions, and applications of known methods in standard dyeing equipment.

The authors describe their laboratory experiments with acid bleaching in which hanks of botany worsted yarn were immersed in solutions of hydrogen peroxide of 4 vol strength containing a small fixed concentration of different acid radicals, while the pH values were adjusted over the pH range 2-9 with caustic soda. Various acids were used——sulfuric, phosphoric, formic, acetic, etc.

The rather surprising result was observed that the degree of bleaching varied little with pH, and the kind of acid used also appeared to have little effect on the bleached result.

The authors describe acid bleaching of wool blankets on a plant scale, using 4 vol strength peroxide acidified with formic acid and brought to pH 3-3.5 with soda ash.

Full details are given of the continuous peroxide bleaching process for cotton now extensively used in the U S. The authors state that interest in this method has developed on the Continent, and is beginning to appear in England. They describe their own laboratory experiments to determine the effect of varying the principal factors (pH and time) in this bleaching process.

In discussing the bleaching of mixtures with peroxide, the authors state that mixtures of wool with other fibers (except cellulose acetate) may usually be treated as for pure wool. Tests for chemical damage carried out on such unions have confirmed that wool-bleaching methods do not cause excessive damage to the secondary fiber. Mixtures of cotton and viscose are quite common, and can be processed as for cotton only. Of the other fibers, care is required with cellulose acetate, as it is susceptible to alkalis and high temperatures; while nylon is only slightly affected except under somewhat stringent conditions of bleaching. Ardil may be processed as for wool.——WHC

Spun Dyed "Fibro"

H Ashton, *Papers AATT* **7**, 137, June 1952.

"Fibro" is the registered trade mark of Courtaulds, Ltd, for their production of viscose rayon staple.

As the standard varieties of "Fibro" got under way in the middle thirties, Courtaulds began to explore the possibilities of coloring viscose rayon staple by including colored pigments in the liquid viscose, so that when the fiber was made it would be colored to the core. For many years now commercial production has been under way with spinners and fabric technicians using these colored fibers in their production.

Approximately a dozen different shades are now being produced in three different deniers and staple lengths. As the colored pigments are embodied inside the fiber, the drafting qualities of the stock remain relatively unimpaired, and therefore it spins with equal ease and calls for little change in the techniques of spinning standard viscose staple yarns. The warp sizing characteristics of these yarns are not affected by the pigment. There is, however, a slight reduction in yarn strength as compared with plain materials.

The author points out the possibility of extending these shades by blending them with one another and with white, to produce a systematic shade range of colors.

In terms of light and washing fastness as measured by standard tests, spun dyed "Fibro" yields very good results, according to the author. He states that with the exception of some lack of fastness to cross-dyeing with vat dyes, and the reaction of some pigments to solvents used in certain methods of dry cleaning, the range of pigment colors as a whole is very fast. He points out in conclusion that spun dyed "Fibro staples, being themselves viscose fibers, retain their affinity for direct dyestuffs, and that blends of these fibers with wool may be cross-dyed with wool colors. ——WHC

Bonded Fabric Development

A W Boese, *Papers AATT* **7**, 141, June, 1952.

A nonwoven fabric can be defined as a web or sheet of textile-type fibers bonded together. Present-day manufacture of these fabrics falls into two classes: (1) autogenous bonding; (2) adhesive bonding.

There are two types of autogenous bonding: (a) bonding by chemically activating the surface of the fibers to an adhesive state; (b) activating the surface of thermoplastic fibers through the application of heat. A means of compressing the fiber webs so activated is necessary in both methods.

In the chemical application, one method is to pass the fiber webs through a sulfuric acid bath of proper concentration and temperature, followed by compressing with a calender, washing and drying.

By heat bonding it is possible to use the various thermoplastic fibers produced today, and unification is accomplished with heat and pressure. As an example, "Plas-Teca" brand fibers produced by the Tennessee Eastman Corporation can be softened and unified on a hot calender in one operation.

Adhesive bonding is accomplished by the application of adhesives such as vinyl acetate, etc, in stripes or open patterns. As an example, a diamond-shaped pattern can be applied by means of a printing roll.

Nonwoven fabrics find application in many fields today, such as reinforcing for plastic laminates, disposable napkins, polishing cloths, filters, bandages, etc. Many of these fabrics can be laundered and dry cleaned. At present none of them are used for clothing, so far as the author is aware, except for baby diapers and costuming.

The author describes the production and use of two nonwoven fabrics manufactured by his company, both made by the thermoplastic bonding process. They are known as "Mistlon" and "Sasheen".

"Mistlon" is composed of 60 per cent plasticized acetate fiber and 40 per cent viscose rayon. It is dyed by running continuously through a cold bath of direct and acetate dyes, followed by steaming. The author describes various methods for producing decorative effects.

The "Sasheen" fabric is made with a relatively light backing of the bonding material, to one side of which parallel continuous filament yarns of cellulose acetate are heat-bonded. This fabric is used mainly for ribbons in the gift-wrapping field.—WHC

A New Method of pH Control in Dyeing and Some Observations on the Metachrome Process

R J Hannay, W H Major and R Pickin, *J Soc Dyers Colourists* **68**, 373, October, 1952.

The metachrome process of dyeing has been the source of considerable discussion during the past four or five years. Statements have appeared from time to time

asserting that this method of dyeing chrome dyes on wool gives rise to more than normal degradation of the wool, and it has been stated that loose wool and slubbing dyed by this method have poorer spinning qualities than when dyed afterchrome.

The main basis of such criticism rests largely on the pH value of the metachrome dyebath, which is on the alkaline side, and tends to rise during the dyeing process, particularly when dyeing is a completely closed system.

The authors review the history of the metachrome process and describe previous attempts by various investigators to solve this problem. What was wanted was a method of preventing the rise in pH during dyeing without causing unevenness, lack of penetration, impairment of fastness properties, or injury to the wool.

Consideration was given to the possibility of making an addition to the dyebath of a neutral or nearly neutral product which during the course of dyeing would liberate an acid at approximately the same rate as alkali is produced by the hydrolysis and reduction of the chrome mordant.

After much experiment, which is described in detail, the authors now report that the rise in the pH of the dye liquor which normally occurs in metachrome dyeing, particularly in closed machines, can be prevented, or even reversed, simply by dissolving an ester, such as diethyl tartrate or ethyl lactate, in the bath at the commencement of dyeing. These esters, under the dyebath conditions, hydrolyze to produce free acid at a suitable rate. Strength tests show that wool suffers no more damage when dyed by the metachrome process, with or without the ester, than when dyed with acid dyes. The use of these esters in metachrome dyeing, and in dyeing with acid milling and Carbolan (ICI) dyes, gives more level results than conventional methods, with no adverse effect on the exhaustion of the dyebath.——WHC

The Evolution of the Application of Pigment Colors to Textiles

C B Peake, *Canadian Textile J* 69, 61, September, 1952.

Because pigment colors possess no affinity for textile fibers, their application was dependent on some means which would give the necessary fixation. This was originally achieved by one or the other of the following methods:

(1) Pigments applied to the fiber in a vehicle such as starch paste, casein, blood or egg albumin, gum, etc.

(2) Pigments precipitated directly on the fiber.

In the first method the vehicle, on drying, produced considerable stiffening of the fabric.

Method (1) was used principally for printing, because the stiffening of the fabric made it unsuitable for dyeing. Method (2) included such processes as Mineral Khaki and Chrome Yellow (lead chromate).

The commercial production of synthetic resins gave added stimulus to the search for new methods of application of pigments to textiles with the assistance of materials not previously used in this connection.

The first pigment prints produced with synthetic thermosetting resins as binders were unsatisfactory because the process was too costly, the fabric was stiffened, and the organic solvent in which the resin was dissolved created a health and fire hazard. These troubles were minimized by substituting for the binder an emulsion of the synthetic resin in water and an organic solvent. Both "water-in-oil" and "oil-in-water" types of emulsion, described in detail by the author, may be used, but the former is by far the more common in printing.

The selection of suitable solvents is governed by solvent power, toxic action, etc. The flash point should not be below 85° F. The author discusses the importance of the "Kauri-Butanol value" of the solvent employed.

The selection of pigments is influenced by particle size and shape, lack of tendency to form aggregates, etc. Only a few of the known pigments are used in printing and dyeing. In the synthetic organic pigments use is made of Indanthrene Red Violet (C I 1212), Indanthrene Blue (C I 1113), phthalocyanine blue and green, toluidine and naphthol yellows and azo oranges and reds.

The author gives full instructions for preparing the resin emulsions, using the "water-in-oil" method. Prints produced by this method are said to have excellent fastness to light and washing. They may be applied alongside all types of colors, and no soaping or aging is required. The principal disadvantage is a tendency to crock.

For pad-dyeing, the "oil-in-water" type of emulsion is recommended, and its preparation described. Curing of the padded and dried fabrics is essential to obtain maximum fastness to washing.

The author also describes some of the more recent developments in bonding agents in Great Britain, Switzerland, and Germany.——WHC

The Treatment of Wool with Sodium Chlorite

C Earland and K G Johnson, *Textile Research J* 22, 591, September, 1952.

The two basic methods for rendering wool nonfelting——by modifying the surface structure or by changing the elastic properties of the fibers——have been reviewed extensively. Detailed studies have been made of many oxidizing agents which degrade the fiber surface and effectively render wool nonfelting. These include chlorine, fluorine, permanganate, and chloroamines. The use of hydrogen peroxide as an antifelting agent has also been studied, and the use of sodium chlorite in strongly acid solutions has been described.

The authors have made a study of the activation of chlorite solutions for antishrinking purposes. A large number of activating substances were tested, both organic and inorganic. They report that the simplest activating agents are formaldehyde and certain sulfur-containing reducing substances (e g, sodium thiosulfate).

The advantages of this treatment over the acid chlorite process are: (1) processing may be carried out in neutral solution at room temperature, with consequently less damage to the plant, and (2) the wool suffers very little damage. When formaldehyde is used, the chlorine dioxide produced during the wool treatment, although not the antifelting agent, produces bad discoloration, and for most purposes an aftertreatment——e g, with bisulfite solution——would be essential. By using sodium bisulfite as activator, the color is much improved, part of the bisulfite probably acting as a bleaching agent during the wool reaction.

The mechanism of the reaction, using formaldehyde as activator, has been investigated in some detail, but it is still obscure.

25 references to the literature are listed. ——WHC

Dyeing Acetate Rayon with Vat Dyes

"Technologist", *Textile Mercury & Argus* 127, 655, October 10, 1952.

A process is described for producing shades with good fastness to crocking on acetate rayon with vat dyes without appreciable saponification of the fiber.

The new process involves padding the acetate fabric with a fine suspension of the vat dye in its unreduced form, and then, with or without drying, treating the rayon fabric with a reducing liquor which contains not only the reducing agent necessary to convert the vat dye into its leuco form, but also an agent which causes the fibers to swell and so be able to absorb the dye rapidly. The final oxidation and washing off follows. Apart from the padding operation the process of dye reduction and fixation on the acetate fiber occupies somewhat less than one minute.

Diacetone alcohol is a very good swelling agent, but there are others, such as methyl and ethyl alcohols, butyl and amyl alcohols, acetone, and methyl ethyl ketones.

The reducing bath contains caustic soda, sodium hydrosulfite, and the swelling agent, and is maintained at 60° C. An immersion of 22 seconds is claimed to be sufficient for complete reduction.

The process is said to be applicable to a wide range of vat dyes. The padding liquor should contain, besides the pigmented dye, a dye-dispersing and wetting agent (e g, a sulfonated fatty amide). It is applied at 40° C.

The process is covered by British Patent 664,340.—WHC

Notes on Stripping Agents

A Chemaster, *Textile Bull* 78, No 8, 75; No 10, 76, 1952.

The widespread use of acetate, viscose rayon, nylon and other synthetic fibers with the natural fibers such as wool, cotton and silk has required a wider knowledge of stripping agents so that they may be applied advantageously and economically in all plant operations.

Stripping agents may be classified as follows:

(1) Oxidizing compounds: sodium hypochlorite (commonly known as "chemick"), sodium chlorite (Textone), organic chlorine (Aktivin), potassium permanganate.

(2) Reducing compounds: sodium hydrosulfite, sodium formaldehyde sulfoxylate, zinc formaldehyde sulfoxylate, titanous sulfate.

The selection of a stripping agent depends upon the type of dyestuff used on the goods to be treated, as well as the nature of the fibers in the goods. The cellulose fibers are sensitive to tendering in acid operations, hence the use of alkaline stripping methods using sodium hydrosulfite and sodium hypochlorite. Stripping with the latter must be handled with care, as overbleaching of cellulose causes tendering.

The sulfoxylate compounds are usually employed advantageously on wool, acetate and nylon. The stripping of Orlon, Dynel, Acrilan and Vicara appears at present to follow similar methods.

Sodium hydrosulfite is applied to cellulose fibers with a mild alkali. A leveling and penetrating assistant is a desirable addition to the bath; nonionic compounds are recommended in stripping naphthol and vat dyed materials. Some of the more desirable penetrating assistants are listed.

The titanous sulfate stripping compounds can be used advantageously for special dyed goods that are resistant and not strippable with alkaline hydrosulfite, though precaution must be used, as these compounds will tender the cellulose fibers unless care is taken.

The use of potassium permanganate is considered too risky for regular stripping, and it may be used only on a modified basis for clearing white cotton and rayon in multifiber fabrics. Hydrosulfite, applied at 90-100° F, may also be employed for this purpose in some cases.

For stripping dyed nylon and acetate fibers dyed with acetate dyes, zinc formaldehyde sulfoxylate is suggested, with addition of acetic or formic acid, and a suitable penetrating agent, of which several types are mentioned.

Another stripping agent for these fibers is Textone, which also requires the addition of acetic acid and a penetrating agent. This treatment should be followed by a bath of sodium hydrosulfite.

The author states that Textone is the only agent yet found that will clean up a majority of acetate-dyed nylon and acetate goods on a practical scale, but warns that stainless steel equipment in which Textone is used will become corroded and pitted unless properly cleaned afterwards.——WHC

Use of Solvents in Fiber Identification

W R Wilson, *Canadian Textile J* 69, 75-7, October 24, 1952.
(paper presented at meeting of AATT)

With the appearance on the market of an ever-increasing number of synthetics, the problem of fiber identification becomes correspondingly complex. The author has tried to evolve a simple, practical scheme which would make possible the positive identification of the more common fibers which are likely to be encountered today.

The scheme makes use of two rather definite properties to pin down the identity of a given fiber: the staining property and the effect of various solvents.

It was decided to use stains which were available on the market and which would not have to be compounded by the analyst. Others may work equally as well, but Calco Stain #2 and General Dyestuff Identification Stain were chosen, since they give a fairly wide range of tints. No special techniques are necessary for using these stains, the fibers merely being boiled for about two minutes in a 1 or 2 per cent solution of the dyestuff and rinsed. If the sample has been dyed, the dyestuff can usually be stripped by treatment with hydrosulfite or other stripping agents.

After the sample has been stained, it is mounted in water on a slide and observed under the microscope. Magnifications of 100X or 200X have been found suitable. All of the fibers with which this scheme is concerned, with the exception of the hydrophobic acrylics, are dyed to definite shades by the Calco and General stains, and in most cases the color will make possible a preliminary identification.

The solvent scheme recommended by the writer is as follows:

Fiber	*Solvent*
Cellulose Acetate	Glacial Acetic Acid
Vinyon HH	Chloroform
Dynel and Vinyon N	Dimethylformamide
Nylon	90% Phenol
Viscose	Cuprammonium Hydroxide
Cupra	Cuprammonium Hydroxide
Cotton	Cuprammonium (partially)
Wool	20% Bleach (NaOCl)
Vicara	20% Bleach (NaOCl)
Orlon	Dimethylformamide 55° C
Acrilan	Conc Nitric Acid
Dacron	

While it is usually possible to differentiate viscose, cupra and cotton by their physical appearance and by the ballooning of the cotton in the solvent, and wool from Vicara by their structional differences, the value of the cross-section as a confirmatory test is emphasized.

The microscopic-solvent technique required is very simple, and skill in its use can rapidly be acquired by the average technician. The stained fibers are dispersed on a dry slide and covered with a glass. When the field is in focus, one drop of the specified solvent applied from a medicine dropper is allowed to seep under the cover glass and the action observed. After each solvent has been applied, the excess solvent must be removed from the fibers before applying the next one. If the scheme is used as listed on a blend of the twelve fibers, each will be dissolved out in turn, so that after the Acrilan has been removed, all that remains on the slide will be the Dacron fibers and any cotton not completely dissolved by the cuprammonium.

Processing of "Acrilan" Acrylic Fiber

G G Whytlaw, *Canadian Textile J* 69, 78-9, October 24, 1952.
(paper presented at meeting of AATT)

This abstract is confined to that portion of the paper which deals with dyeing.

"Acrilan" can be dyed with acid dyes, chrome dyes, acetate dyes, some azoic dyes, and some vat dyes. At the present date, only the first four classes of dyes mentioned have been subject to much investigation.

Acid dyes are applied at 205° F as a maximum, with gradual addition of sulfuric acid. Penetration into the fibers depends on time, temperature, and acid concentration. Exhaustion depends mostly on

the percentage of acid in the dyebath. The fastness properties vary widely with the choice of dye and with the depth of shade.

If "Acrilan" is dyed in presence of wool, the majority of the dye will be picked up by the wool, and therefore it is difficult to dye unions with wool using acid dyes. With "Acrilan" and nylon, some fair unions have been obtained.

The best all-around fastness properties have been obtained to date with chrome dyes applied by the top chrome method.

The acetate dyes color the "Acrilan" quite easily when dyed at temperatures approaching the boil. The fastness properties, however, are not as good as those obtained with acid dyes, and therefore the acetate dyeing method is usually reserved for the dyeing of blends of "Acrilan" with wool or with viscose or cotton where the use of acid dyes is not practical.

The naphthol or azoic dyes have shown some promise when dyed by the technique of using both the base and the naphthol together, followed by developing with nitrous acid at 160° F and up.

The vat dyes have shown promise in package experiments, especially at the higher temperatures of application. Indigosols have shown promise in continuous piece dyeing.

Blends of viscose and "Acrilan" can be dyed with direct dyes for the viscose and acetate dyes for the "Acrilan", or by acid dyeing the acrylic fiber and direct dyeing the viscose.

At temperatures of 235-245° F the time of dyeing "Acrilan" and the acid concentration can be materially reduced.——WHC

• PATENT DIGEST •

PAUL WENGRAF

NYLON——Quinone Treatment for Increasing Heat Resistance G, 1

U S Pat 2,597,163
(Michaels, Machlis——May 20, 1952)

Nylon-warp fabric used as ironing cloths disintegrate quickly when exposed to temperatures of 300° F or more regardless of whether the filling consists of monofilament yarns or rayon staple fibers. The use of rayon staple filling in conjunction with nylon warp is generally preferred because of the higher abrasion resistance imparted, though the resistance to heat seems to be inferior still to that of fabrics composed entirely of monofilament yarns. A nylon-warp fabric may lose 70% of its original strength within five hours and up to 90% within 15 hours when subjected to an ironing temperature of 180° C (365° F).

The resistance to ironing is said to be greatly improved by treating the cloth in an aqueous suspension of 0.5-5% of benzoquinone or anthraquinone (preferably 1%) at a pH less than 7 for periods of time ranging from 12 seconds to 24 hours and at temperatures from 15 to 100° C). The cloth is then rinsed free of quinone and dried. It may lose about 25% of its strength when heated for 15 hours at 350° F while untreated cloth loses about 90% under the same conditions.

Ordinarily, starch used on the cloth to be ironed gradually covers the unprepared nylon and adheres thereto. This new preparation is said to prevent such adhesion.

References cited by the Patent Office:

U S Pat 2,484,529 (Du Pont/1949): the thermoplasticity and solubility of polymeric materials (especially ethylene polymers or nylon-type polymers) in organic solvents is decreased by treatment with a ketone (benzophenone, acetone, benzoine) and subsequent exposure to U V rays to increase the resistance to elevated temperatures.

U S Pat 2,312,469 (Du Pont/1943): sizing compositions used in nylon knitting yarns consisting of less than 5% of water soluble proteins, e g, soybean protein blended with triethanolamine, glycerine and sodium carbonate dispersed in water.

U S Pat 2,265,119 (Du Pont/1941): plasticizing nylon yarns by immersing them in an aqueous-alcoholic solution of a plasticizing agent of acid character, e g, sebacic acid, a phenol derivative (tert amyl phenol) and/or a sulfonamide (amyl benzene sulfonamide).

"ONIUM" DYESTUFFS——Printing Methods D, 1

U S Pat 2,599,371
(Imperial Chemical Industries —— Chadderton, Thornton——June 3, 1952)

The term "onium" dyes is generally used for dyes containing quaternary ammonium—, ternary sulfonium— or isothiouronium groups linked by methylene bonds to aromatic nuclei. They comprise water-soluble derivatives of the anthraquinone series, of other vat dyes, such as indanthrones, and of the phthalocyanine dyes, known particularly for their brilliance and extreme fastness to light.

Brit P 633,160 (same Company and same inventors, cf *Am Dyestuff Reptr 39,* 389, 1950) refers to printing effects obtained with this group of dyestuffs. The present patent appears to be similar, covering the printing of colored patterns on textiles with a mixture of "onium" dyes using weak acids and acid salts plus an alkaline salt of a weak acid. This composition changes upon being heated from a weak acid condition, necessary to keep the dye in solution, to a weak alkaline state in which the dye is fixed on the fiber.

Example: a dye obtained from copper-tri (chloromethyl)-phthalocyanine reacted with tetramethyl thiourea is pasted with starch thickener and acetic acid; sodium acetate is added to the paste, which is printed on cotton, dried and aged at 100° C for 5 minutes, rinsed, soaped at the boil, rinsed and dried again. A bright greenish-blue shade of good fastness is obtained.

Although phthalocyanine dyes are mentioned in some of the examples, other fast dyes transformed into "onium" compounds may be applied as well.

Among other references cited by the Patent Office:

U S Pat 2,464,806 (Imperial Chemical Industries/1949): water-soluble phthalocyanine dyes, characterized by a content of one or more quaternary ammonium or similar groups and linked to benzene nuclei of the phthalocyanine complex, are described.

U S Pat 2,290,906 (*ibid*/1942): obtaining coloring matters of the phthalocyanine series by converting alkylthiophthalocyanines into water-soluble sulfonium compounds through treatment with alkylsulfates or alkylsulfites.

U S Pat 2,277,628 (*ibid*/1942): pyridine-substituted phthalocyanines are quaternized with dialkylsulfates or other alkylating agents, solubilized with concentrated acids and reprecipitated with water to prepare pigments.

U S Pat 2,120,741 (Ciba/1938): water-insoluble azo dyes dissolved in pyridine

are treated with an acylating agent (chloromethyl benzoylchloride) to give a water-soluble product that is split with alkali to regenerate the original dye upon the fiber. (Possibly this covers the "Neocotones").

Brit P 587,636 (Imperial Chemical Industries/1947): similar to U S Pat 2,464,606 (above), same applicationn date.

Brit P 576,270 (*ibid*/1946): preparing new yellow azo dyes containing a chloromethyl group. These are insoluble in themselves but may be solubilized by a pyridine treatment to give a water-soluble pyridinium compound.

Brit P 576,234 (*ibid*/1946): preparing new yellow azo dyes containing a chlorodimethyl mercapto group and solubilizing them by a treatment with dimethylsulfate or the like to obtain water-soluble ternary sulfonium compounds.

HEAT SETTING MACHINE for Synthetic Fabrics G, 3

U S Pat 2,599,486
(Werner Machine Co——Rose——June 3, 1952)

The present specification refers to heat-setting machines for nylon or other heat-sensitive fabrics in which the treating rollers are heated with liquids or gases. Expensive equipment is necessary for obtaining, and thereafter regulating, the temperature required for this operation.

This patent describes a machine which employs simple rollers heated from within and mounted under a hood for removal of combustion gases. Figure 1 shows the rollers in vertical alignment under the hood (66). Fabric (58) from roll (57) passes over guide rolls (59 and 64), through a slot in the hood to guide roll (67), and then around heated rollers (32 and 45), which turn inversely in order to heat both sides of the fabric equally. The fabric is then guided out of the hood to cooling roller (78) and finally wound upon roll (83).

An essential feature is the heating device (see Figure 2). A heat-delivering element (49), connected by pipe (51) with a fuel source, is located in the center of the heating rolls. Each pipe has perforations (52) through which flames are projected against the curved-top radiating surface (53).

The rolls are kept at the proper temperatures by means of control units (116,117) —see Figure 3. Shoes (110, 111) move longitudinally along the roller surfaces, transmitting the heat condition to the control units.

References cited by the Patent Office:

U S Pat 2,488,937 (Parkes, Roberts/1949): processing or setting rayon or nylon by passing the fabrics over one or more rolls heated to accurately-controlled temperatures. The rolls consist of outer and inner cylindrical shells, the burner being located within the inner shell. Heating is accomplished uniformly with a high-boiling liquid introduced into the space between inner and outer shell.

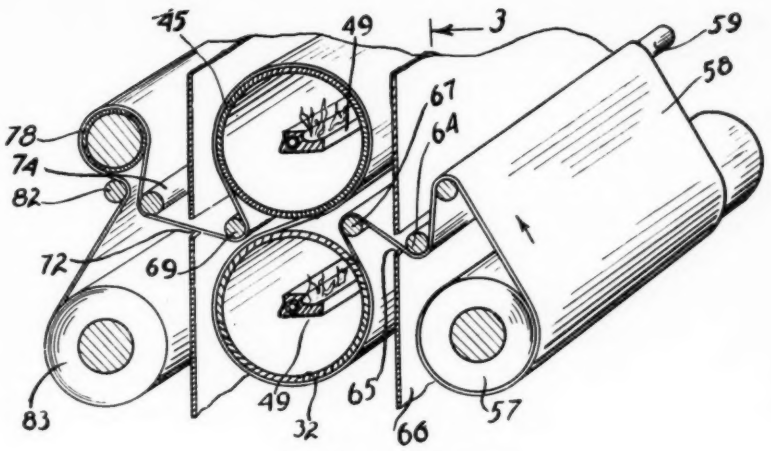


Figure 1—USP 2,599,486

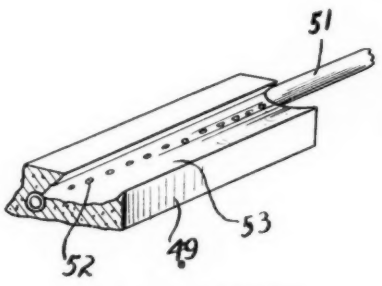


Figure 2—USP 2,599,486

U S Pat 2,293,278 (S D Warren Co./1942): finishing paper by sufficiently moistening (and thereby softening) the surface, passing the moistened material through a super-calender before the moisture has time to penetrate, and finally pressing the softened surface against the hard metal roll.

U S Pat 1,962,882 (Shotwell/1934): a process for uniformly conditioning overdried paper by conducting air, conditioned to a high relative humidity, around the dry paper web, thus avoiding the step of spraying with water or introducing steam.

U S Pat 1,951,714 (Tompkins/1934): a paper making machine in which a wet paper web passes over suction members and under electrical heating devices, which set the newly-formed paper before it contacts the felt.

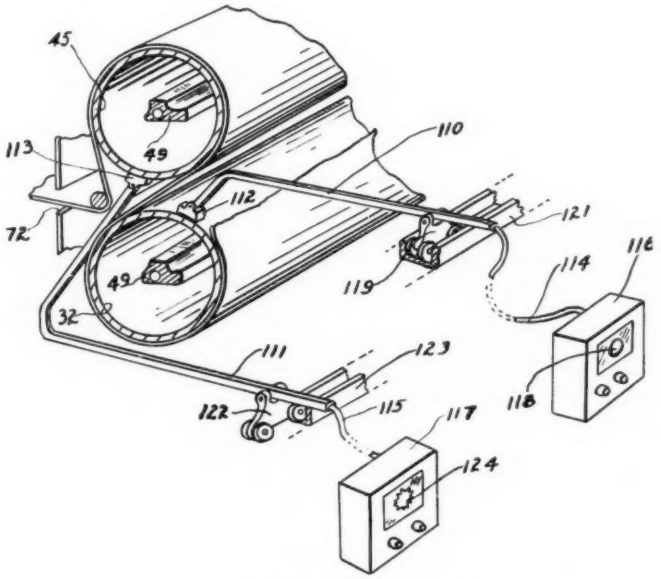


Figure 3—USP 2,599,486

STABILIZING CELLULOSIC FABRICS—Dimethylhydantoin-Formaldehyde Condensates G2, 04

U S Pat 2,602,017-8
(Beer——July 1, 1952)

The object of these two (copending) patents is to stabilize cellulosic textiles by an aldehyde-liberating compound without the risk of discoloration or substantial loss of tensile strength.

In the preamble to U S Pat 2,602,017 some prior stabilizing methods are discussed. Aldehydes, such as formaldehyde, applied in acid media by themselves, might impair the strength of cellulosic fibers; this is true of glyoxal treatments which reduce the strength of rayon about 20% and that of cotton about 50%. The inventor's U S Patents 2,484,545 (cf *Am Dyestuff Reptr 39,* 97, 1950) and 2,541,457 (*ibid 40,* 374, 1951) are quoted. They respectively refer to the combined use of glyoxal plus chlorates or other oxidizing salts or to the use of glyoxal (or other aldehydes), acids and alkali sulfates. Even in these cases a certain degree of discoloration is unavoidable, with energetic soaping required after the antishrink treatment. Consequently dyes of lesser fastness used in the printing or dyeing of goods that have to be stabilized in the last finishing step can not be employed, it is pointed out.

It is suggested that a compound capable of splitting off aldehyde under acid as well as under alkaline conditions be used as an equimolecular condensate of dimethylhydantoin and formaldehyde, i e, monomethylol dimethyl hydantoin, containing about 19% of available formaldehyde that is liberated in acid media at elevated temperatures. Acids used are nonvolatile organic types, such as citric or oxalic, giving the preferred range of pH 2-2.5. The fabrics are squeezed, dried at 80-100° C and baked at 120-150° C. It is required (as in other shrinkproofing methods) that all traces of gums, starch or the like be removed first. Based on a 100% pick-up, 1-5% concentrated padding solutions may be used. Permanent stability and increased abrasion-resistance are said to be imparted; moreover, chlorine retention and substantial discoloration are noticeably absent.

Example: cotton and spun rayon fabric were treated in a solution of 25 g monomethyloldimethylhydantoin, 4 g oxalic acid, 6 g anhydrous sodium sulfate, and 1 g Igepal G T A (as wetting agent) per liter. pH of solution: 2.2. The goods were dried without tension at 80° C and cured for 5 minutes at 135° C (for cotton) and 3 minutes at 149° C (for rayon). Favorable results are shown in tables accompanying the patent.

U S Pat 2,602,018 is a continuation-in-part of the former patent. Its purpose is to combine the aforementioned stabilizing effect with a creaseproofing finish by applying a mixture of monomethyloldimethylhydantoin with dimethylolurea (from 2 mols formaldehyde and one mol urea). The shrink- and crease-proofing effects obtained by a similar process, as described in U S Pat 2,602,017, are reported as excellent.

Example: solutions of the hydantoin derivative and dimethylolurea (in ratios 20:40, 30:40, 30:60, 25:80 per liter) containing 0.6% of organic acid, 0.4 g anhydrous sodium sulfate and 0.1% of wetting agent were employed for padding a spun rayon fabric. The pick-up was again 100%; the fabric was dried at 180° F and baked at 310° F. The creaseproofing effect was unchanged after washing, the shrink resistance and tensile strength proved satisfactory and abrasion resistance was increased.

Among other references cited by the Patent Office (for both patents):

U S Pat 2,441,859 (Alrose Chem Co/1948): shrinkproofing goods by impregnating with formaldehyde or glyoxal in the absence of acid substances and aftertreating with steam containing acid vapors (cf *Am Dyestuff Reptr* 37, 768, 1948).

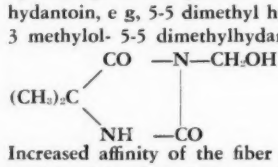
U S Pat 2,159,743 (Du Pont/1939): a mold-growth-inhibiting wrapping material, generally prepared from cellulose derivatives, is impregnated with formaldehyde, methylolurea or similar compounds.

U S Pat 2,108,520 (Böhme Fettchemie/1938): a wrinkleproof finish obtained on rayon fabrics by application of acid solutions of an aldehyde followed by steaming.

French Pat 880,185 (Rohm & Haas/1943): resin-type condensates of hydantoin and aldehyde, e g, dimethyl hydantoin, formaldehyde and acrolein, are recommended for various applications in the textile and leather industries.

Brit P 547,846 (Cilander A G/1942): a stabilizing treatment for cellulosic textiles in which aldehydes are combined with a fiber esterifying- or etherifying component, such as Velan (Zelan), i e, stearoxy methylene pyridinium chloride.

Reference may also be made to Brit P 530,883 (Ciba/1940): water-soluble acyl derivatives of sparingly-soluble azo dyes (probably the "Neocotones") are printed by adding to the paste a water-soluble hydantoin, e g, 5-5 dimethyl hydantoin or 3 methylol- 5-5 dimethylhydantoin



Increased affinity of the fiber to the dyestuff is claimed. It is interesting to note that dichlorodimethylhydantoin acts as a chlorine donor in the shrinkproofing of wool (cf Du Pont's U S Pat 2,414,704, *Am Dyestuff Reptr* 36, 419, 1947).

FINISHING NYLON——Durable Coatings with Polyvinylchloride G2, 01

U S Pat 2,606,845
(Du Pont——Van Etten——Aug 12, 1952)

Polyvinylchloride coatings show poor adhesion to nylon fabrics. Firmer fixation of the coating layer can be attained only by deeper penetration of the first layer through the interstices of the woven fabric. Greater or lesser adhesion therefor depends merely on the greater or lesser depth of vinyl polymer striking through the nylon weave.

The inventor has found a solution to this problem by applying a substratum of a soluble polyamide to the nylon fabric prior to coating with polyvinylchloride solution. Solutions of this type, i e, ethanol-water-soluble derivatives of the standard nylon polyamides, are prepared, according to U S Pat 2,430,860 (Du Pont/1947), by reacting the initial polyamide with formaldehyde and an alcohol in the presence of an acid catalyst. The hydrogen of the amido group CO-NH- is thereby replaced by the group CH_2O-alkyl. Alcoholic solutions of products formed from chains containing, e g, the recurrent units N-(CH_2OCH_3)-CO- (N-methoxy methyl polyamide) or —N-($C_4H_9OCH_2$)-CO— (N-isobutoxy methyl polyamide), are used for coating the nylon fabric on both sides. After the solvent is evaporated, polyvinylchloride dissolved in ethylmethyl ketone, to which a high-boiling ketone (cyclohexanone or isophorone) has been added, is applied on both sides. The high-boiling ketone, which proves to be essential for good adhesion, has a mutual dissolving action for polyvinylchloride and for the layer of the soluble polyamide, which in turn is firmly anchored to the nylon weave. Fabrics coated according to this process (apparently intended for Army use) are said to retain the flexibility of the original material while gaining the special properties of polyvinylchloride coatings.

References cited by the Patent Office:

U S Pat 2,443,580 (Du Pont/1948): nylon coated with N-alkoxymethyl polyamides is improved in mechanical properties, such as flexibility and resistance to crocking, by reducing the content of the simultaneously-formed N-methylol polyamides to less than 4%.

U S Pat 2,332,373 (*ibid*/1943): flexible, transparent sheet material is produced by embedding a screen structure in a film of ethylene polymer.

U S Pat 2,322,953 (*ibid*/1943) an anchoring coat of a polyamide solution in a solvent is applied to a woven fabric, e g, a cotton cloth, to give a substratum for cellulose nitrate.

U S Pat 2,265,119 (*ibid*/1941): plasticizing nylon by immersion in a solution of

a plasticizer, such as phenol or sulfonamide in a nonsolvent for nylon, thereby bringing about selective adsorption.

U S Pat 2,253,146 (*ibid*/1941): sizing nylon (particularly for knitting yarns) by applying coatings of polymethacrylic acid or other acrylic polymers.

COLORED OIL-IN-WATER EMULSIONS——Pigments and Resins in Outer Phase

D, 2, 07

U S Pat 2,601,661
(American Cyanamid——Kienle, Peiker——June 24, 1952)

Former methods of printing or dyeing with water-in-oil or with oil-in-water emulsions are characterized by a dispersion of the film-forming, pigment-fixing substances in the oil phase. The preamble to the present patent states that compositions of this type require the use of oil-soluble films and compounds of high solvent power, both of which are rather expensive as well as dangerous for some types of fibers, such as cellulose acetate or vinyl acetate-chloride polymers, because of their swelling action.

In contrast the current invention advocates the use of emulsions in which the film-forming components as well as the color are dispersed in the aqueous phase while the oil phase, constituting from 4.5-70% of the entire emulsion serves merely to give the paste the necessary consistence. This oil needs only to be inert; therefore, any cheap organic liquid, such as a petroleum hydrocarbon, will suffice. It needs only to have sufficient vapor pressure at curing temperatures and to volatilize although its boiling point should be above this temperature to avoid boiling out before proper curing; formation of continuous films that bridge the interstices is eliminated this way. Thus the choice of the oil depends on the curing temperature required. That the equipment can be cleaned with water is advantageous since the ingredients are all in aqueous solution or dispersion.

The emulsions also contain hydrophilic colloids as emulsifying agents; alkali-soluble products, such as caseinates or alginates, however, are not compatible with acid curing agents and must be excluded. The hydrophilic colloid must act at the same time as a plasticizer and possibly enter the curing process by reacting with the film-forming resin condensate. Since acid-curing aminoplasts (urea- or triazine aldehyde) are generally used, the selection of hydrophilic colloids is restricted to compounds capable of producing acid-stable emulsions while they themselves form insoluble bodies in the curing operation. In this instance methylcellulose proved to be an especially suitable emulsifying agent. Coloring matters of the water-insoluble or water-soluble kind may be employed.

Example: an aqueous solution of methylcellulose is mixed with an aqueous solution of dimethoxymethyl urea, a suspension of bentonite and phosphoric acid. This mixture is stirred at high speed with a water-dispersible paste of a copper phthalocyanine blue pigment. Finally a petroleum fraction of boiling range 150-210° C (aromatic content about 23%) is slowly added. Goods printed with this paste are dried for one half hour at 50° C only. Prints produced by this method show remarkable wash fastness according to AATCC Wash Test #4 (cf *1946 AATCC Technical Manual and Yearbook*).

It is especially advantageous that the curing temperature is extremely low in many cases, e g, when petroleum fractions are used. An increase in curing temperature has no effect in these cases. In other examples it is pointed out that the oily phase consists of toluene, cyclohexane, nitropropane. Higher boiling or less volatile compounds, such as octylacetate or pine oil, require higher curing temperatures accordingly.

References cited by the Patent Office:

U S Pat 2,361,277 (Ciba/1944): stable oil-in-water emulsions for textile printing pastes; the oily phase consists of a water-immiscible solvent, the aqueous phase contains a resin-forming amine (dicyandiamide-urea) and the dispersant is a formaldehyde-casein composition, which comprises no more than 10%.

U S Pat 2,338,252 (Interchem Corp 1944): printing paste containing a pigment dispersed in a mixture of polyvinylalcohol and urea-formaldehyde resin in solvent-soluble state and a volatile base (morphine), which serves to prevent gelation.

U S Pat 2,196,367 (Rohm & Haas/1940): stable aqueous emulsions of reaction products of urea-formaldehyde in an alcoholic, water-immiscible solvent, emulsified with water-soluble alkylcelluloses and a quaternary base such as dimethylphenylcetyl ammonium chloride.

Brit P 349,464 (Imperial Chemical Industries/1931): Emulsions of the oil-in-water type, which are useful as finishing agents and which set at relatively low temperatures, may be obtained by stirring a water-soluble urea-formaldehyde condensate with an oil-modified alkyd resin dissolved in naphtha. The alkyd resin component by itself does not quite harden.

BOOK REVIEWS

TEXTILE PRINTING, Materials, Methods and Formulae

Fred F Jacobs. Published by Chartwell House, Inc, New York, 1952. 229 pages. Price, $5.00.

An American expert of long intimate experience with textile printing in both mill and laboratory has authored a practical, elementary, easy-reading and short primer of textile printing for those who are not yet expert in the field. All that is required of the reader is that he have an interest in the art; a theoretical chemical or engineering background is not required to understand this book. But even the master will find it convenient to get an immediate answer to the question of how to carry out some phase of printing outside his immediate experience. There is no modern book in English that fulfills this simple "how-to" objective in printing.

Jacobs primarily instructs the reader in the proper formulation of printing pastes for different dyestuff classes and styles and their development for the screen or roller printing of cotton and rayon. He also covers more briefly the printing of wool, acetate, nylon and glass; the printing of the newer wholly synthetic fibers is not covered in spite of reference to their properties in other places. Pigments for printing are dismissed with only two pages even though they are widely used where superior abrasion resistance in washing is not required. A practical working advantage of the many formulations that are suggested is that they are given in percent, parts per 1000, and ounces and pounds per gallon and per 12 gallons (pail) so as to be useful for both American and metric units.

The other portions of the book are all designed to contribute to the main theme. The opening chapter describes in a wholly practical manner the dyestuff classes that are employed for printing, while the second chapter discusses in the same way the natures of the different fibers of inter-

est to the printer. Quick and possibly overly-simplified identification tests for fibers are also given. The third chapter outlines rather broadly the preparation of goods for printing, the fourth chapter explains types of thickeners, and the fifth, machine, block, screen, spray, and batik printing methods. Steaming, neutral and acid aging, soaping, and special effects in printing, such as plisse, delustering, discharge, color discharge, etc, follow the main section. The closing chapter shows how to distinguish different classes of dyes on the fiber.

In an abbreviated book, such as this, many topics are only briefly or inadequately covered; some will not be found at all. Although the research chemist will find here no review of patents or of recent references to the literature, for which he must look elsewhere, he will find a partial but useful list of sources where these can be found. Gross misstatements and typographical errors are not common, but some generalizations should be more carefully limited in scope. On page 195 lead acetate, not potassium chromate, should have been given as a test for chrome in a fused ash suspected of containing chromium.

"Textile Printing" should certainly be in the library of every printer, and especially should it be in the hands of the student in school or of the tyro in the mill who wants to learn printing with a minimum of distracting details. An excellent index will help the reader find what he wants.—OH and CZD

ENCYCLOPEDIA OF SURFACE-ACTIVE AGENTS

J P Sisley. Translated from French into English by P J Wood. IV & 540 pages. Chemical Publishing Co, Inc, New York, 1952. Price, $15.00.

P J Wood, who has already translated several Sisley technical articles from French into English, has done a service to those interested in surface-active agents, most especially the textile chemist who uses them most, by translating Sisley's "Index des Huiles Sulfonees et Detergents Modernes," which was published in its first edition in 1949. Since the average American is so insulated from foreign languages that he rarely masters them, he will be glad to know that Sisley's authoritative index is now available in simple, readable English generally free from Gallicisms.

Wood's translation bears a more descriptive title than the original in that it brings out more clearly that the content of the book is concerned primarily with surface-active agents. In Part I, which takes up a little more than a third of the book, is given first a twelve-page discussion of the industries in which surface-active agents are useful, much of the material employed by Sisley in this section having been derived from American sources. A page then covers the seven deficiencies of soap that give synthetic detergents advantages over this oldest and most generally and nearly universally used surface-active agent. Sisley's inference that soap was introduced by the Romans is misleading, however, as Pliny, a Latin writer, mentioned the use of soft and hard soaps by the German barbarians and did not claim invention of soap by the Romans.

In the next section is found an important key to the advantage of the Sisley book, namely, his classification of all surface-active substances into many chemical subheadings under the three main captions of anion-active, cation-active, and non-ionic compounds. This method greatly facilitates an understanding and simplification of the descriptions of individual products in Part II. A fifth and very valuable portion of the book is used to explain the chemistry, preparation and uses of these different types of surface-active compounds. The textile chemist will be interested in a special two-page discussion of textile uses that follows. A convenient feature is a listing (34 pages) of the commercial products under each coded type of surface-active chemical. Many patent references increase the usefulness of the whole book.

A contention of compounders of textile chemicals is that they are able to combine known and commonly available chemicals (not usually disclosed) to obtain products of special usefulness because they have had special experience in the needs of certain textile processes. After reading the next thirty-page section of the book, the average textile chemist will be seriously tempted to try compounding his own mixtures for special textile purposes, since this section contains a compilation of commercial products under different mixture types.

Part II, constituting the greater portion of the Sisley-Wood volume, contains an excellent and comprehensive alphabetical list of commercial surface-active agents from all the world and especially from the United States. Included are also commercially compounded mixtures containing surface-active agents, in which the latter are only secondary, that is, the products are offered for specific special purposes, such as repellency or fabric softening. For each entry in the list are given the brand name, manufacturer, identical or similar products, chemical class and composition, appearance, properties, chemical reaction, applications, and often quantities recommended.

Although Part II of Wood's translation has been importantly enlarged over the French original to correspond with its three-year later appearance, it cannot contain all current offerings. Even McCutcheon's list, portions of which appear at frequent intervals or the AATCC yearly "List of Textile Chemical Specialties," cannot keep up with this changing field. For example, Peregal O is discussed by Sisley for stripping, whereas Albigen A and Peregal ST, which represent a later and much superior development, are not mentioned. Although information in this section is apparently quite accurate, one cannot expect Sisley and Wood to have as accurate information about any specific product as the manufacturer himself. Any important firm can therefore find minor errors here and there. But these do not greatly impair the general accuracy and usefulness of the book.—CZD

ADR NOW AVAILABLE ON MICROFILM

Arrangements have been completed with University Microfilms, 313 North First Street, Ann Arbor, Michigan, for supplying subscribers of the Reporter with a microfilm edition. This arrangement is effective with the 1952 volume. The film copy will be delivered at the end of the volume year for those who subscribe to the service and it will include all issues published during that period. It is estimated that the film edition requires only 5% of the space required for the paper edition, which is bound. Complete information is available from University Microfilms.

NEWS

• Commercial Standard for Flammability of Clothing Textiles

Flammability of Clothing Textiles, Commercial Standard CS191-53, having been endorsed by the industries concerned, becomes effective on January 30, it is learned from the Commodity Standards Division, U S Department of Commerce.

Several years ago a number of fatalities resulted from the extremely flammable character of certain articles of clothing, particularly long-napped rayon chaps of children's cowboy suits. It was realized that before legislation could be passed to control the sale of safe and unsafe clothing a nationally recognized method would be required for distinguishing between safe and unsafe clothing textiles.

The American Association of Textile Chemists and Colorists together with the National Retail Dry Goods Association undertook a series of investigations to develop a reliable method of test and apparatus for conducting the test. The Commodity Standards Division was requested to act as a coordinating agency to secure national recognition of the method. A number of laboratories made extended series of tests to correlate the method with the practical experience of the industry. Recent publicity arising from the discovery of highly flammable brushed rayon sweaters on the market sped up the work on the development of the standard.

The standard represents the combined opinion of an Industry Committee representing cotton and rayon producers, and fabric manufacturers, finishers, converters, wholesalers, retailers, and consumers, coordinated by AATCC and NRDGA.

It is to serve as a guide in the manufacture and sale of only those commodity textiles which are not dangerously flammable. It is said to provide the public with the maximum protection from such textiles while at the same time permitting the unrestricted merchandising of the great majority of those fabrics which are known to have no unusual burning characteristics.

It includes standard methods of testing clothing and textiles intended for use in clothing; establishes three classes of flammability: Class 1, covering those textiles generally accepted by the trade as having no unusual burning characteristics; Class 2, covering those textiles recognized by the trade as having flammability characteristics between normal and rapid and intense burning; and Class 3, covering those textiles recognized by the trade as being unsuitable for clothing because of their rapid and intense burning. It establishes limiting requirements for identifying each of these three classes.

Printed copies of the standard will be available later from the Superintendent of Documents. Until that time mimeographed copies of the recommended standard accepted by the industry (TS-5131) may be obtained by addressing a request to Herbert A Ehrman, Commodity Standards Division, United States Department of Commerce, Washington 25, D C.

• Hardesty Merger

Announcement was made on January 1 that Hardesty Chemical, Inc, has been merged into W C Hardesty Co, Inc, and will operate henceforth as the Hardesty Chemical Division of W C Hardesty Company, Inc.

The firm will continue to operate from its present headquarters at 41 East 42nd Street, New York, N Y. Howard M Abbott, vice-president of Hardesty Chemical Company, Inc, has been appointed vice-president of W C Hardesty Company, Inc. Other personnel will continue in their present capacities. Products of the merged corporation will include its present lines of Century Brand fatty acids and glycerine, together with Harflex plasticizers, sebacic acid and capryl alcohol.

• CEMA Head Looks for Accelerated Growth

Conveyor systems promise to provide a major market for automatic control devices in 1953, according to Harry C Davis, president of the Conveyor Equipment Manufacturers Association.

"The trend is toward consideration of an entire factory as a machine, with matrials handling and processing closely integrated for continuous-flow production," he said in a year-end statement.

"Demand increases for automatic controls built into conveyor equipment. Heretofore control devices have been added by the user as afterthoughts."

Mr Davis said that the conveyor industry had its biggest year in 1952, and that the prospect is for accelerated growth due to pressure for economy which can be best achieved by greater mechanization.

• NICD Set for 44th Convention

All is in readiness for the 44th Annual Convention of the National Institute of Cleaning and Dyeing, which is to be held February 12-15 at the Statler Hotel, Cleveland, O.

Activities get under way at 8:30 Thursday evening in the Grand Ballroom with a get-together party and dance. On the following day a Ladies Day Program will feature a tour of the city with a stop at the Art Museum and luncheon at Wade Park Manor. Later, a cocktail party and style show, sponsored by the Higbee Company, will be held in the Ballroom. The NICD Alumni Society will meet in the Ohio Room at 6:00 on Friday.

Technical activities will commence at 7:30 Friday with the showing of the technicolor motion picture "The Disciplined Story," a Bates Fabrics production. The film tells the story of the development and application of wrinkle- and stain-resisting finishes on cotton fabrics. This will precede NICD's production "Is the Drycleaning Industry being Washed Away?" Henry Benoit, NICD vice-president, will preside at this session.

A Saturday morning session, over which T E Milholland, past president of NICD, will preside, will feature a talk "Public Relations — The Priceless Profit" by Jay Archer Kiss. Following this will be a panel discussion, "Selling—Here's How!", in which Harold Bender, Swiss Cleaners, Indianapolis, Ind and Henri Foussard, Model Launderers and Cleaners, St Paul, Minn will participate.

Walter Duncan, NICD Secretary-Treasurer, will preside over a Sunday morning session, which will include a panel discussion of the subject "Charged System Cleaning—The Practical Side." Participating will be Del E Olmstead, Teasdale Cleaners, Cincinnati; Fred Cramer, Cramer's Master Cleaners, Elgin, Ill; Ralph Ackerman, Klean Rite Cleaners, Peoria, Ill; and John Brittain, Park Cleaners, Monterey Park, Calif.

The NICD Banquet, floor show and dance will be held Saturday evening at the Carter Hotel.

• Cross to Speak at AATT Symposium

Marvin R Cross, president of Greenwood Mills, Inc, will speak on "New Textile Horizons Through Technology," following luncheon at the second one-day symposium of the American Association of Textile Technologists Feb 3 at the Hotel Statler, New York.

Divided into morning and afternoon sessions featuring three talks and a panel discussion, the symposium will also have several commercial exhibits.

The three talks scheduled for the morning session are: "Technological Development of Apparel Fabrics", by Walter E Scholer, manager, fabric development department, American Viscose Corp; "Technological Development of Home Furnishings Fabrics", by Otto J Haufe, research director, Turner Halsey Co, and "Technological Development of Industrial Fabrics", by Herbert R Schwarz, director of research and fabric development, Wellington Sears Co, Inc.

At this session, George H Hotte, technical director, A M Tenney Associates, Inc, will preside as chairman, and Erb N Ditton, research director, Gotham Hosiery Co, Inc, will offer introductory remarks. The morning session will begin at 9:30 and end at 11:45.

Following the luncheon scheduled for 12:45, Mr Cross will deliver his talk.

At 2:30 pm, the panel will provide a discussion along the same lines as the morning talks.

Those slated to take part in the discussion, which will afford answers to prepared and floor questions, are: J Robert Bonnar, General Dyestuff Corp; E H Decker, Hess Goldsmith Co; Charles W Dorn, J C Penney Co, Inc; Ralph M Gutekunst, Hellwig Dyeing Corp; Otto J Haufe, Turner Halsey Co; Robert Helfenbein, Golden Decorative Fabrics; Clark M Heydon, United Piece Dye Works; Frederick F Hubach, Princeton Knitting Mills; Richard T Knopf, Belding Heminway Co, Inc; Waldemar Kuenzel, Deering, Milliken & Co, Inc; Charles A Lasky, Celanese Corp of America; Samuel Lippincott, American Viscose Corp; Joseph Meierhans, J P Stevens & Co, Inc; A L Peiker, Calco Chemical Division, American Cyanamid Co; Ernest Pfeiffer, Robbins Mills, Inc; Leo Reinard, Alexander Smith, Inc; Millard K Ryan, E I du Pont de Nemours & Co, Inc; Herbert R Schwarz, Wellington Sears Co; W Bailey Sellars, Burlington Mills Corp; H E Shearer, American Viscose Corp, and George B Suhrie, Fox-Wells & Co, Inc.

Chairman of the panel discussion is Clare W Bendigo, American Cyanamid Co.

Celanese Corp, Tennessee Eastman Corp, Union Carbide & Carbon Corp, Virginia-Carolina Chemical Co, Brabender Corp, and Custom Scientific Instruments, Inc, will be among the exhibitors.

• Fellowship in Chelate Chemistry

A new fellowship in chelate chemistry, providing for one year of graduate study and research at any accredited institution of the student's choice in the U S or under the jurisdiction thereof, has been announced by Frederick C Bersworth, president of the sponsoring Bersworth Chemical Company. It is open to all U S citizens who have completed at least one year of graduate study and are currently working toward their Doctorate in any major branch of science. The stipend is $3500.00 payable in advance.

The Selection and Advisory Committee will announce the first award in the spring of 1953. Among its members are Edgar Britton, President of the American Chemical Society and Research Director of the Dow Chemical Company; Melvin Calvin, Profesor of Chemistry at the University of California in Berkeley; Martin Rubin of the Chemo-Medical Research Institute of Georgetown University, Washington, D C; John Bailar, Jr, of the University of Illinois; Victor Wellman, Research Director of American Cyanamid Company and Harry Foreman of the AEC at the University of California in Los Alamos, New Mexico. Arthur E Martell is Chairman of the Committee. Co-author with Dr Calvin of an outstanding work on the Metal Chelates, Dr Martell is Professor of Chemistry at Clark University in Worcester, Mass.

The purpose of the Bersworth Fellowship is to "encourage research on metal chelates and on the control of cations in solutions in the fields of pure chemistry and in its applications to industry, agriculture and medicine."

Application for the new Fellowship should be made directly to Arthur E Martell at Clark University in Worcester, Mass.

Based on the first few years of experience, it is Dr Bersworth's intention to make the Bersworth Fellowship a continuing one with a view to an expanding Fellowship program.

• Carbide Announces Price Reduction

Carbide and Carbon Chemicals Company has announced a price reduction of two cents per pound for mixed isopropanolamine, a physical mixture of mono-, di- and tri-isopropanolamine.

A technical sheet (F-6325) on mixed isopropanolamine is available from Carbide (30 East 42nd St, New York 17, N Y).

• Semet-Solvay Division Enters Petrochemical Field

Semet-Solvay Division, Allied Chemical & Dye Corporation, 40 Rector St, New York, N Y, is now producing on a small plant scale at Buffalo, New York, a new material derived from ethylene, called Alcowax. A full-scale Petrochemical Plant is under construction at the same location for the production of this material.

It is reported that unlike most other polymers of this type the present grade of Alcowax has wax-like hardness and a melting point of approximately 100° C. It is further stated that the material has the properties of being hard, of white translucent color and is tasteless, nontoxic and substantially odorless. Also noted is its quality of having a melting point higher than that of the natural waxes, against a moderately low melt viscosity, so that it is readily dispersible in various types of waxes and other mediums at moderately low temperatures. A modification in development is classified as emulsifiable.

Sales and inquiries will be handled by Petrochemical Sales, located at 40 Rector Street, New York 6, N Y.

• New Emkay Substantive Softeners

Two new types of softeners are now in production by Emkay Chemical Co, 319 Second Street, Elizabeth, N J.

Emkalon A, an anionic softener that is said to be substantive to rayon, acetate, nylon and cotton, may reportedly be used on whites where softness as well as optimum retention of white with no yellowing is desired. Emkay recommends it where resistance to light fading of prints on dyed goods is important. The product reportedly can be used in conjunction with gas-fading inhibitors, crease-resistant finishes, starches and allied substances. Stability to heat and storage is said to be good. According to the manufacturer, Emkalon A gives a soft, silky hand which is highly resistant to washing, and it can be used in the scouring, dyeing or finishing bath. It is said to be an excellent replacement for sulfonated tallow in the slashing operation and to reduce shedding on the loom.

Emkalon C, a concentrated substantive softener, is said to produce a full mellow hand on fabrics with resultant soft draping qualities. It can be used on rayon, acetate, nylon and wool with excellent resistance to washing, according to Emkay. They further claim that it does not yellow whites, develop odors on storage nor effect light-fastness of colored goods. Emkalon C can be used in the quetsch, jig or box, it is stated, and it is readily dissolved in hot water forming solutions which are stable to hard water, mild acids and alkalies.

Oak panelling lends antique flavor to textile research laboratory in six-story building of Hilton-Davis Sales Company.

• Hilton-Davis Opens Textile Service Center In Boston

The official opening in Boston of its textile service laboratory and distribution center to the New England textile industry has been announced by Nelson S Knaggs, vice-president in charge of sales of The Hilton-Davis Chemical Co Division, Cincinnati, Ohio.

Known as Hilton-Davis Sales Co, the new center is located in a modern six-story building at 2-4 Storer Street. The building was acquired in March, 1952, from Claflin-Dorman, which had served as Hilton-Davis' textile representative in this area since 1949. Arthur Davis is manager of the operation.

The newly-opened center in Boston has been organized for a two-fold purpose, according to Mr Knaggs. It will function as exclusive distributor to the textile trade in northeastern United States of dyestuffs produced by the Cincinnati chemical manufacturer. Its second major purpose is to consult with mill personnel in order to service their requirements promptly.

Mr Knaggs has declared that the opening of the building is intended to demonstrate the confidence that is felt in the continuing prosperity and growth of the New England textile industry.

Warehouse facilities have been set aside in the firm's building to permit it to operate as regional distribution depot, with emphasis on rapid delivery to mills from Maine to Delaware. A complete line of Hilton-Davis dyes are on hand, including stabilized diazos (the Spectrolenes), naphthols (in solution and powder form), fast color salts, fast bases and acid dyes (for use by wool mills).

Fully-equipped research laboratories have been installed, which are designed to perform accurate color-matching and comparative strike-offs in textile printing. Routine checks for strength and standardization are given all dyestuffs and dye intermediates prior to shipment.

• Chemstrand Board Members Hold 15th Session

Members of The Chemstrand Corporation Board of Directors concluded their 15th regular quarterly meeting on Dec 15 with commendations to the operating staff for their efforts in bringing the new corporation's facilities into operation.

Meeting as a body for the first time in Decatur, the members had their initial opportunity to tour the Acrilan fiber manufacturing facilities, the four-building research and development center and the company's administrative headquarters building.

During dinner at the Hotel Lyons, Charles A Thomas, president of Monsanto Chemical Company, speaking for the board, complimented President Osborne Bezanson and the department heads and all Chemstrand employees for the work that now is reaching the completion stage.

The company, formed in May, 1949, broke ground for the Decatur project February 26, 1951. The plant was brought into operation this past August. During the construction phase, research and development of Acrilan was carried on in three laboratories in Ohio, Massachusetts and Pennsylvania.

• New Buyer Attitudes Cited by Kohlman

Chemicals that add desirable qualities to natural and synthetic fibers are rapidly gaining such widespread acceptance, according to Clem W Kohlman of American Cyanamid Company's Textile Resins Department, that major changes in current methods of labeling textile products are becoming more and more desirable.

Citing the fact that *Good Housekeeping* has granted its seal of approval for Cyanamid's line of functional textile finishes, Mr Kohlman said that the growing acceptance of chemically treated fibers is rapidly leading to new buying attitudes on the part of consumers. "Already, many many consumers want to know what textile products will do, as well as what they are made of."

"With the innumerable fibers and countless combinations of them in blends now on the market, along with the wide range of different qualities that can be added to them chemically, buying finished textile products will be less confusing if they are described in terms of their wrinkle, fire and spot resistance, water repellence and general durability, as well as the different fibers used."

• Support for Wool Research Program Renewed

The Wool Bureau, on behalf of its affiliate, International Wool Secretariat, representing wool growers of the British Dominions, recently advised Dr John H Dillon, Director of the Textile Research Institute, that it has renewed its support of the wool research program, initiated at the Institute in 1949.

In a letter containing a check for $10,000 as the first semi-annual contribution, F Eugene Ackerman, President of The Wool Bureau, stated that the program typifies a "constructive example of international cooperation which seeks scientific results that know no nationalistic boundary lines."

The wool research project, conducted in the Institute's laboratories in Princeton, N J, was originally launched by The Wool Bureau, on behalf of its two affiliates, the IWS and the American Wool Council, which represents U S wool growers.

• PTI Alumni to Meet Feb 6

The 52nd Annual Banquet of the Alumni Association of the Philadelphia Textile Institute will be held February 6 at the Warwick Hotel, Philadelphia.

Chairman of the Banquet Committee, William A Popp, will be assisted by Frederic H Barth, Industrial Rubber Co; C Carroll Baxter, Jr, Baxter, Kelly & Faust, Inc; Kenneth C Booth, Importing Beer Distributor; Frank L Giese, Philadelphia Textile Institute School; Edward G Haack, General Dyestuff Corp; David Herrick, Raytric Knitting Mills, Inc; Peter J Osborne, R C Osborne & Co; and J William Wilson, Delta Finishing Co.

Edwin G Michie, Andrew Y Michie and Sons Co, president of the Alumni Association, will act as toastmaster.

Reservations ($8.00) are being made through Mrs E Selma Crane, secretary, at the Association office, 3243 W School House Lane, Philadelphia 44, Pa.

• GDGA Annual Clinic

The Garment Dyers Guild of America held its annual tecbnical clinic at the plant of the Almore Dye House in Chicago, on Friday, December 5th, 1952.

The technical sessions were followed by business meetings at the La Salle Hotel, at which four new companies were presented for membership.

The Board elected for 1953 consists of Fred Nuttall, *President;* John Egli, *Vice President* and Lucien Deitrich, *Secretary-Treasurer*. Mr Nuttall is head of the Electric City Dye Works, Scranton. Mr Egli served as secretary-treasurer since the Guild first organized, and owns General Dyeing Co, Inc, in Indianapolis. Mrs Deitrich, new to the Board, aids her husband in the management of Deitrich Dyers in St Louis.

Allan J Copeland was retained for an additional year to act as Executive Secretary, and Paul Grant Advertising will represent the Guild as advertising and publicity agency. Mr Copeland is a Vice President in the Grant organization.

The major topic of the clinic itself revolved around the handling of some of the new synthetic fibers. After studying the operation at the Almore plant, the membership was addressed in a luncheon meeting at the La Salle Hotel by P L Meunier, J H Trepagnier and John Kelley of the Du Pont Company.

The members were advised of progress by Du Pont in developing methods for cleaning and dyeing of the new man-made textiles. It was admitted that while much progress has been made, much more is needed before cleaners and dyers can approach some of the new fibers confidently.

It was recommended that textile manufacturers be pressed into more accurate labeling programs as one means of assisting the dyer and cleaner in determining the proper way to handle a given garment. It was also suggested that garments that appear likely to be disappointing after cleaning or dyeing be refused and turned back to the retail store with the hope that the store in turn will turn to the manufacturer and in time this pressure will result in getting co-operation at the fabrication level.

The Guild will have a booth at the NICD Convention in Cleveland in February.

The 1953 Clinic will be held in November at the Steuewe plant in Rochester, N Y.

• FDC to Offer "Orientation in Textiles"

Herbert R Mauersberger, director of textile courses at Fairleigh Dickinson College, has announced that a four-point course, "Orientation in Textiles," will be offered on Thursday evenings beginning February 5. Registration for the course, which will be limited to 30 students, is now open.

The course, a general introduction to textiles, covers the scope, economics, and history of the textile industry; raw materials used; fabrication of yarns; fabrics and their uses; processes, machinery and methods used; converting and classifications of all types of fabrics, finished and greige. Buying, selling, and promotion will also be discussed. Plant trips will be arranged.

The course will be taught by Mr Mauersberger and should be of interest to chemical salesmen, laboratory technicians, engineers, merchandising students, and chemists as well as accountants and specialty products salesmen.

* * * *

The Textile Department of Fairleigh Dickinson College recently received from the Waldrich Company, Delawanna, N J, the gift of a single-color laboratory print machine with chrome-plated roller. The machine is hand operated and will be used by the students in the printing and dyeing course. Valued at $800, the machine has been placed in the George Walker Room of the Hesslein Textile Building. The gift was made possible through the efforts of J E Marble, president of the Waldrich Company, and Francis S Richardson, of the same company, who is also an instructor in a printing course at the college.

• Dynel Dramatized In New Kit

To dramatize the performance features of Dynel in blankets, Carbide and Carbon Chemicals Co has introduced a novel kit containing materials for the following tests:

1. *Stain test.* Wool blanket swatches, Dynel blanket swatches, a vial of ink and a vial of Clorox bleach are provided. A wool blanket swatch and a Dynel blanket swatch are stained with ink and immersed in an undiluted bleach for two minutes. The wool swatch disintegrates, while the stain is removed from the Dynel blanket swatch and the color remains unchanged. This experiment is designed to permit the "tester" to prove that a Dynel blanket can be cleansed of stains or disinfected in undiluted household bleach without being harmed.

2. *Fire test.* A match or lighter flame is applied to one end of a Dynel blanket swatch, which shrinks from the flame and does not flare up, since Dynel does not support combustion.

3. *Shrinkage test.* To demonstrate the washable, quick-drying qualities and dimensional stability of Dynel blankets, a Dynel swatch and a ruler are provided. After being measured, the Dynel swatch is washed or soaked in hot water. The swatch is then wrapped in a towel and the excess water squeezed out.

Other sections of the kit outline Dynel's various properties and advantages.

• PTI Research Dept Awarded Two Fellowships

Fellowships sponsored by the Pennsylvania Laundry Owners' Association and the Pennsylvania Association of Dyers and Cleaners have been awarded the Philadelphia Textile Institute's Research Department.

Included in the Laundry Owners' Research Fellowship will be the study of quality control in the individual laundry under the Association's Certification program, while under the Dry Cleaners' Fellowship, the Institute will assist the Association in the preparation of technical bulletins on new fibers and the handling and analysis of problem garments.

Supervising the work on these fellowships at the Institute is Dr William A Endriss, Endriss Chemicals, Philadelphia, Pa. His experience in this field includes work with Celanese Corporation of America, the Philadelphia Quartermaster Depot (Army), Gelatin Products Company, and C E Jamieson & Co, Detroit, Mich, Wyandotte Chemical Corporation, Wyandotte, Mich, and the National Institute of Cleaning and Dyeing, Silver Springs, Md. In 1950, Dr Endriss formed his own company.

• First Shipment of Acrylonitrile from Texas City Plant

With appropriate ceremonies, the first shipment of acrylonitrile from Monsanto Chemical Company's Texas City, Texas, plant was initiated on December 30th. A tank car, bound for The Chemstrand Corporation, Decatur, Ala, was christened by Charles Allen Thomas, Monsanto president, and J R Mares, vice president and general manager of the company's Texas Division.

Acrylonitrile is being produced by Monsanto from acetylene, and at Texas City the new facilities are producing acetylene from natural gas rather than by the conventional process from calcium carbide.

R U Haslanger, general sales manager of the Texas Division, has stated that the new source of supply of acrylonitrile will be good news to the chemical industry, pointing out that the growth of the synthetic fiber industry will be greatly helped by this new large productive capacity.

• $20,000,000 Expansion Broadens Chemical Horizon for PC&C

With the recent announcement that its 35 new coke ovens had reached full operation, Pittsburgh Coke & Chemical Company marks the first result of a $20 million expansion at its Neville Island plant, five miles downriver from Pittsburgh, Pa.

The new battery of coke ovens is one of eight units involved in the expansion program, which will be completed early this year. Others are a new blast furnace, four new chemical plants, and additions to the cement plant and boiler plant.

According to R M Marshall, president, the added facilities will strengthen Pittsburgh Coke & Chemical's position as a producer of chemicals for varied national markets. The company will also increase its output of basic products for regional markets.

In evaluating the expansion, Mr Marshall said: "The present expansion represents the company's most important step forward to date. We have for some years placed increasing emphasis on the production of chemicals, not merely in their crude form, but suitable for marketing to end-use industries. This has been reflected in the company's sales volume during recent years. Our total sales of chemicals has grown from less than $4 million in 1947 to more than $18 million in 1951, an increase of some 390 per cent as against a gain of 125 per cent in the sales of our other products."

The new ovens, which reportedly cost $6 million, will give the firm a total of 140 by-product ovens. The company has been turning out 600,000 tons of furnace coke and 75,000 tons of foundry coke yearly, to which the new ovens will add about 33 per cent in capacity. The company is the only major by-product oven source of foundry coke in the Pittsburgh area.

Much of the coke output moves into the company's blast furnaces, of which there will soon be three. The gases collected from the coking process are the source of many industrial chemicals.

Some $3,300,000 of the present expansion budget is allocated to additional chemical facilities, but this is on top of more than $7 million spent in the past four years for new chemical plants, it is pointed out. Together with capital expenditures during the years 1947-1951, the company is said to have committed $34 million to plant expansion and improvements since the war, a sizable portion of which has been for additions to the spreading network of chemical plants. The production of chemicals will also be benefited by the enlarged coking operations.

The company's new fine chemical plant is expected to develop additional end-use markets through the production of dyes and other fine chemicals.

The new chemical plants will present further opportunities for the upgrading of the company's coke by-products. For example, 2, 4-D comes from phenol, which comes from the tar liberated in coking. For the production of both plasticizers and dye intermediates, the company will use its phthalic anhydride (produced from naphthalene, another tar derivative).

A second unit for the production of activated carbon, which is produced directly from coal, is being added.

Most costly unit in the expansion is an $8 million blast furnace, which will reportedly add 300,000 net tons of iron to the company's present capacity of 470,000 tons a year.

• NYU Offers Course in Man-Made Fibers

A comprehensive survey of modern man-made fibers will be given in a new course to be offered for the first time in the Spring term by New York University's Division of General Education.

Orlon, dynel, Dacron, Acrilan, Fiberglas, nylon, Vicara, X-51 and other materials will be considered in the class entitled "The New Synthetics: Man-Made Fibers," to be held on Tuesdays from 8:10 to 9:55 pm, February 3 through May 19.

Instructor for the course will be Ira Zane, graduate of the Philadelphia Textile Institute and textile engineer who is now designer, stylist and production analyst for United Merchant Sales.

Lectures will cover the new fibers from the raw materials stage through spinning, weaving and dyeing processes. New trends in manufactured items, such as one-fiber fabrics and blends and apparel and industrial uses, also will be considered.

Discussions will highlight development and merchandising on all levels, and special attention will be given to designing and styling synthetic cloths and government-specification fabrics for the armed forces.

Guest lecturers and their dates of appearance are: Harold Welburn, dyeing and finishing executive, United Piece Dye Works, February 25; Lawrence Weiss, vice-president, Robbins Mills, Inc, March 25; Perkins Baily, men's wear editor, *Look* and *Men's Wear*, April 29, and Leah S Chupack, chief of the clothing and footwear branch, research and development section, New York Naval Supply Center.

Registrations for single lectures or for the entire course will be accepted by the Division of General Education at its offices, 1 Washington Square North, New York 3, N Y, daily from noon to 8 pm and on Saturdays from 9:30 am to 1 pm, January 19 through February 6.

• Celanese Petrochemicals Plant Begins Operations

The new $17,000,000 petrochemicals plant of Celanese Corporation of America at Pampa, Texas, has begun operations. According to R W KixMiller, general manager of the company's Chemical Division, principal output of the plant during this initial phase of operations will be acetic acid and acetic anhydride. Construction of additional units to produce other derivatives of these chemicals is planned as soon as work on present facilities is completed. This plant also increases the company's production capacity for methanol and acetone, it is pointed out.

The Pampa plant is the third chemical producing unit of the company. A larger plant at Bishop, Texas, has been in production since 1948, and chemicals are also produced at Newark, N J.

A new Celanese process for the production of acetic acid and acetic anhydride, which was developed at the company's petroleum chemistry research center at Clarkwood, Texas, is being used in the Pampa operation. Raw materials are liquified petroleum gasses from the Texas Panhandle area where the plant is located.

• Avisco Pre-Setting Licenses Now Royalty-Free

Licenses to pre-set acetate tricot fabrics by the method and apparatus developed by American Viscose Corporation are now royalty-free, the corporation has advised its licensees. Licenses are still required to make and use the machine, it is emphasized. These licenses are still issued through the corporation's Textile Research Department at Marcus Hook, as in the past.

The pre-setting machine, developed by the Textile Research Department in 1949, is said to eliminate the expensive tacking and untacking of the selvages, otherwise necessary to prevent the setting of the curl in the edges during dyeing. It results in straight course lines, prevents "crow's feet" and crease marks, controls the stability of acetate rayon tricot, improves the hand, and permits the knitting of much longer lots, which in turn may be dyed in one strand, it is claimed.

• Sandoz Transferring N E Office

Sandoz Chemical Works, Inc, is now in the process of moving its New England offices and laboratory from 59 Oliver St, Boston, where it has spent the past 18 years, to new facilities at Tower and Main Sts in Hudson, Mass.

The new Sandoz site in Hudson is said to offer ample space for its expanded operations in New England.

Dr S D Gershon (left), Assistant Director of Research of Lever Brothers Company, President of the Society of Cosmetic Chemists, awards the Society's medal to Dr Everett G McDonough (right), Vice-President and General Manager of Evans Research and Development Corp.

The presentation took place at a dinner-meeting of the Society of Cosmetic Chemists at the Biltmore Hotel, New York, N Y, on December 11, 1952.

The Medal Award is given annually for outstanding contributions to the art and science of cosmetics. Dr McDonough is author of many papers and holder of numerous patents representing original developments in the cosmetic field.

• TRI Fellowships

The Textile Research Institute will make available three predoctoral fellowships at Princeton University for the 1952-53 academic year. The fellowships will be awarded to students who intend to become candidates for the ph D degree in the Departments of Chemistry or Chemical Engineering. A stipend of $1200 and payment of all University fees are provided for first- and second-year Fellows, while $1800 and fees are granted to third-year Fellows who have passed the General Examination for the Ph D degree. Programs of study for Textile Research Institute Fellows are the same as those of other graduate students in the departments concerned except that the Fellows carry out thesis research in the Institute's laboratories in Princeton.

The Institute is an industrially-supported research organization engaged in fundamental studies of the chemistry and physics of fibrous materials and other high polymers. No confidential work is done for any group, and the research of the permanent staff as well as that of Fellows is freely publishable. The Director of the Institute and several of the staff are members of the faculty of Princeton University.

Further information and application blanks may be obtained from Dr J H Dillon, Director, Textile Research Institute, Box 625, Princeton, N J.

• Delta Finishing Expanding

The Delta Finishing Company, a division of J P Stevens Co, Inc, is making a major addition to its Wallace, S C, plant. The Daniel Construction Company, constructors of the original plant, are builders for the project.

• PTI Fellowship Opens 4th Season

The Philadelphia Textile Institute Fellowship opened its fourth season with a new series of Industry dinner meetings on November 4 at Park Drive Manor. William A Popp, William A Popp and Associates, was the speaker. Martin Berman presided.

Mr Popp outlined for the students the function of the mill representative in the marketing chain and the opportunities for service in this field.

The Philadelphia Textile Institute Fellowship was organized among the students in 1948 to promote understanding within the school and the textile industry; to encourage the exchange of ideas in the industry; and to encourage the spirit of service in the organization and the textile industry. Instrumental in setting up the Fellowship was David Herman, now a faculty member in the Fabric Analysis Department of PTI. The group numbers 69 and is headed by Martin Berman, president; Abraham Tarriff, vice-president-secretary; and Richard Brantigan, treasurer.

• ASQC Meeting in May

William A Newell, Publicity Chairman, Textile Division, American Society for Quality Control, has announced that the Division will have its next meeting in Convention Hall, Philadelphia, Pa, on May 27, 28 and 29.

♦ New Celanese Research Lab Opens

Scientific investigations by Celanese Corporation of America in the field of petrochemistry are now being carried on in a new research laboratory which opened at Clarkwood, Texas, on January 5th, to supplant temporary buildings erected during World War II.

The new office and laboratory building, operated by the research and development department of the company's Chemical Division, contains 21,000 square feet of floor space and houses 11 separate laboratories; 27 offices; a library; conference room; drafting room; duplicating room, and lobby. The building is of brick and concrete, with all interior partitions of semiglazed tile.

Construction of the new facility was started fourteen months ago and was virtually completed last September. However, in order to avoid interruptions of research projects which were under way, the transition from the old to the new laboratories was a slow process.

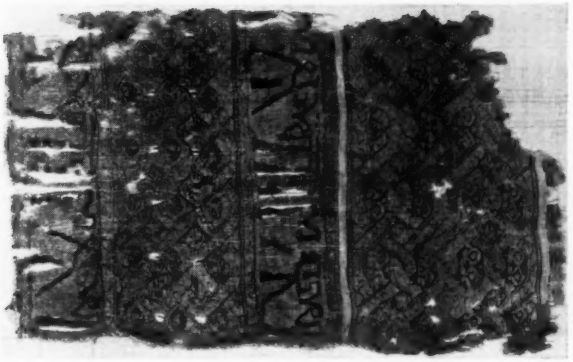
The Clarkwood operation, center of all Celanese Corporation of America petrochemical research, is under the direction of Henry K Dice.

Achievements of the research group have been incorporated into manufacturing operations at the Bishop and Pampa, Texas, plants of Celanese Corporation of America and at the Edmonton, Alberta, plant now being erected by Canadian Chemical Company Limited, a Celanese affiliate. During the past year, as a result of successful work accomplished at Clarkwood, two new producing units were established at Bishop for the production of paraformaldehyde and trioxane.

First research work on chemicals derived from petroleum was started in 1934 at Celanese's Cumberland, Md, plant with Mr Dice as one of the members of the group. Work done there led to the construction of the Bishop plant, the first Celanese unit for manufacture of chemicals from petroleum sources. In 1946, the chemical research division was moved to Clarkwood after temporary quarters were erected.

Two other members of the original research team are still associated with it, S B Jeffries, supervisor of the analytical department, and C J Maxwell, head of process development and engineering. A fourth member, V T Anwyll, is now manager of the Edmonton, Alberta, plant.

6th Century Coptic Fabric, woven by Christianized descendant of early Egyptians.



12th Century Islamic Egyptian Fabric, embellished with conventionalized Arabic writing.

• Ad Series Draws on Past to Spark Ideas for Modern Textile Design

A service to designers in the textile industry, according to W Allen Traver, Chairman of the Board, is the object of a unique series of Franklin Process Company advertisements scheduled to appear during 1953. Mr Traver states: "Textile designing is a universal art, and one of the oldest known to man. In examining the collections of yarn-dyed fabric samples in the Museum of Art at Rhode Island School of Design in Providence, we were struck with the idea: Why not reproduce some of the fine designs of the past, to show that the possibilities for creative patterning are literally unlimited?"

Of thousands of fabric samples in the R I Design School Museum, Franklin Process narrowed the choice to six specimens representing varied historical periods and geographical origins. Included are: a 6th Century tapestry weave loomed by an unknown Copt, a Christianized descendant of the pyramid-builders of ancient Egypt; a 12th Century Islamic fragment, with motif of conventionalized Arabic script, also woven in Egypt; a 14th Century narrow fabric from Peru, loomed during the late Chimu period, representing a school of "sophisticated primitivism"; an Italian fabric of the same century, a 16th Century silk brocade from Spain, emblazoned with royal lions; and a 17th Century Chinese design.

In the hope that these exhibits may suggest novel ideas for modern textile designs, Franklin Process underwrote a program of color photography to reproduce the originals with the greatest possible accuracy. Technical advice was provided by Rudolf Berliner, Curator of Decorative Arts at the R I School of Design Museum, and Graham Keith, Assistant Curator.

A major function of the R I Design School's Department of Decorative Arts is to familiarize students with good design through first-hand study of fine pieces of work from the earliest periods of history to the present day. Their attention is directed to the influence of the intended use of materials on design and techniques of production. The Franklin Process project is an instance of a company's taking advantage of services offered by the Decorative Arts Department of the Providence institution.

The Textile Collection from which Franklin Process made selections covers the work of craftsmen from about 300 A D to the present. Through purchase and gifts, it is particularly strong in fabrics woven during the Seventeenth, Eighteenth, late Nineteenth and Twentieth Centuries. Most important part of the collection is the Jacob Ziskind donation of some 500,000 to a million woven and printed designs which came from the Arnold Print Works of North Adams, Massachusetts. Another notable collection is the recently-acquired Alphonse Haus collection of 19th and 20th Century French and American woven silks.

A full color reprint of each Franklin Process reproduction of fabrics in the Museum of Arts, R I School of Design, may be obtained on request from Franklin Process Company, Department 8, Providence, Rhode Island.

• IM&CC Plans Addition to Carlsbad Facilities

International Minerals & Chemical Corporation plans a substantial addition to its sulfate of potash facilities at Carlsbad, New Mexico, A Norman Into, vice president in charge of International's Potash Division, announced last month.

"The site of the new plant has been laid out already and construction will start without delay, probably within the next few months," Mr Into stated. "The plant will be in production around the beginning of 1954. The added production resulting from this expansion will amount to approximately 35,000 tons of sulfate of potash a year," he added.

• "Hunterlab" Formed

A new development, testing and consulting group devoted to appearance and related properties of materials (color, diffuse reflectance, gloss or luster, turbidity, haze, opacity and the like) has been formed under the name Hunter Associates Laboratory, 5421 Brier Ridge Rd, Falls Church, Va.

Richard S Hunter, formerly chief optical engineer with the Henry A Gardner Laboratory of Bethesda, Md, will have as his associates Marshall Powell, formerly with the Gardner Laboratory, and James D Ferguson, Jr, formerly with Aviation Corporation.

The optical laboratory, in suburban Washington, D C, is offering the following types of service to research and manufacturing organizations:

1) Advice on appearance instrumentation and preparation of specifications.

2) Tests of materials for regular and special appearance properties, including calibrations of standards and referee tests.

3) Designs of improved appearance-testing instruments.

4) Development of procedures (including equipment where necessary) for testing, inspecting, and in some cases automatically controlling the appearance quality of manufactured and processed materials.

• Free World Ups Sulfur Output

Free world efforts to increase the supply sulfur have resulted in more than 900,000 long tons per year of new productive capacity since January 1, 1952.

This tonnage represents 28 projects in eight nations. The United States ranks first with 16 projects accounting for estimated production of approximately 700,000 tons. Canada is second with five for about 84,000 tons and Mexico third with two for 13,000 tons. Single projects are listed for Norway, 75,000; Sweden, 14,000 tons; Ecuador, 10,000 tons; England, 10,000; and Austria, 5,000 tons.

The most recent projects to be placed in production are those of Freeport Sulphur Company at Bay Ste Elaine in the Louisiana marshland, a Frasch-process operation in which the mining plant, built on a barge, uses heated sea water as the melting medium; Sinclair Refining Company, Marcus Hook, Pa, and Shell Chemical Company, Houston, Tex, for recovery of sulfur from refinery gas; Stanolind Oil & Gas Company, Slaughter, Tex, for obtaining sulfur from sour natural gas, and Canadian Industries, Ltd, Copper Cliff, Ont, for recovery of sulfur from smelter gas.

The 28 projects are among more than 90 listed in the tabulation made public last July by Langbourne M Williams, Jr, Freeport president, showing the efforts being made on many fronts to increase the free world's sulfur supply. It was estimated that the combined productive capacity of these projects would result in an additional 4,000,000 long tons of sulfur in all forms by the end of 1955.

Sulfur was in short supply from mid-1950 to mid-1952. Supply is now sufficient to meet demand and the government has removed all controls except those dealing with price and international allocation.

Largest of the new undertakings is that of Texas Gulf Sulphur Company at Spindletop dome near Beaumont, Tex. Spindletop has an estimated capacity of 400,000 long tons of sulfur per year. Although there are other Frasch-type mines being developed, this and Bay Ste Elaine are the only new mines completed in 1952.

Canada's biggest operation is that of Canadian Industries at Copper Cliff with a capacity of 40,000 tons of sulfur equivalent per year from surface deposits. The largest new project abroad is that of Electro Kjemisk which lately began producing the equivalent of 75,000 long tons of sulfur a year at Skorovass, Norway. Swedish Shale Oil Company is recovering 14,000 more tons of sulfur from refinery gas with an expanded plant at Kvarntorp, Sweden, while Shell Oil Company, Ltd, is recovering 10,000 tons in a similar operation at Stanlow, England. India's production is obtained from sulfur minerals at the Government Fertilizer Works at Sindri.

• Annual Book Award Announced by Aries

R S Aries and Associates is establishing an annual award for the first and second best books in the field of economics of the chemical process industries, according to an announcement by Dr Robert Aries, President. The purpose is to encourage chemists, chemical engineers, economists and chemical executives who are experts on economic aspects of the industry to put their knowledge in print.

The first prize will be a gold statuette symbolic of chemical economics and the second prize a similar statuette of silver. Advance royalties of $1,500 will be paid to the winners of the first award, and of $500 to the winner of the second award at the time these awards are made. The first presentation will be in September 1953, and entries may be submitted through July 1, 1953.

The winning manuscripts will be published by *Chemonomics, Inc,* an affiliate of R S Aries & Associates. In order to be eligible, a book must have a minimum length of 20,000 words and must be written especially for the contest. Each manuscript must be accompanied by an entry form which may be had upon request from Chemonomics, 400 Madison Ave, New York 17, N Y. Manuscripts should be addressed to the publisher, and authors should retain carbon copies.

Dr Aries announces that the judges will be headed by Prof David D B Hertz of Columbia University, and Prof John Happel of New York University.

• USI to Sell National Distillers Metallic Sodium

U S Industrial Chemicals Co, Division of National Distillers Products Corporation, 120 Broadway, New York 5, N Y, has assumed the responsibility for the sale of metallic sodium manufactured by National Distillers Chemical Company, Ashtabula, Ohio, also a Division of National Distillers Products Corporation, according to an announcement by L A Keane, USI vice president in charge of sales.

Harry R Tennant, sales engineer, has been tranferred from Ashtabula to the New York office of USI to handle all matters pertaining to sodium. His work with users and potential users of sodium will be under the supervision of Warren E Johnson, USI manager of chemical sales.

Metallic Sodium now will be sold and serviced through all of the USI sales offices in Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Kansas City, Los Angeles, Louisville, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, St Louis and San Fransisco.

• Gallowhur Acquires Canadian Plant

George Gallowhur, President of Gallowhur Chemical Corporation, announced the acquisition of the chemical plant formerly occupied by Stroid Laboratories at Grenville, P Q, Canada. Gallowhur Chemicals of Canada, Ltd has been organized to operate the Canadian plant.

The plant, located on the Ottawa River, consists of four main buildings. The reaction building is said to be equipped to carry out all types of reaction processes. The equipment also includes the new Podbilniac extractor and a new spray dryer in a separate 4-story building.

Commenting on this acquisition, Mr Gallowhur stated that this is the first step in implementing his new plant expansion program to enlarge and expand the facilities of the company.

Grant McKenna has been named Production Manager of Gallowhur Chemicals of Canada, Ltd and William Grey, plant superintendent. Mr McKenna was plant and process engineer at the Ossining plant of Gallowhur Chemicals Corp, and Mr Grey was formerly in charge of the Grenville, P Q, plant under the previous management.

The Canadian plant will manufacture the Purasan line of quaternary ammonium compounds and the Puratized line of organic mercurials.

• Du Pont to Build Lab at Kinston

A laboratory for research and development work on "Dacron" polyester fiber will be built on the site of Du Pont's new fiber plant at Kinston, N C, it is learned.

Scheduled for completion late in 1954, the two-story structure to be built at a cost of more than $3,000,000 will be part of the Textile Fibers Department's technical division. It will house offices, research laboratories, and semiworks equipment required for basic and exploratory research on Dacron. Approximately 55 technical men will be assigned to the new facilities.

Currently the Textile Fibers Department is carrying out research on Dacron in The Carothers Laboratory at the company's Experimental Station in Wilmington, Del, and it will continue at that location until the new building is completed.